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Greek Sepulchral Monuments.

OF the minor works of art that ancient Greece has left us, perhaps none have commanded such ready attention or such universal admiration as the large and constantly-increasing series of grave reliefs. Their full beauty can only be realised, it is true, at Athens itself, in the large collection in the Central Museum; and still better at the Hagia Trias, where a number of the best specimens still remain *in situ*, and where the specialist will necessarily study them; but the general public need not wander further than (the cellars of) the British Museum, or, if he desire full daylight, he may see in the South Kensington Museum casts of upwards of twenty well-selected instances.

Any one who looks at these reliefs for the first time will be struck, not only by their beauty, but by their extreme simplicity; here, at least, he will think, there can be little difficulty of interpretation,—we are in the presence of no recondite mythology. We have on one a citizen with his dog; on another a mother and child; another, a lady with her toilette-box; another, a youth mounted on his horse,—everywhere humanity in its simplest, most natural aspects. If it were so, the present paper would not be needed, except, perhaps, briefly to call attention to certain special beauties of execution, and to fix an easily-ascertained chronological sequence. The case is far otherwise; grave archæological difficulties have arisen on the mature consideration of these apparently simple designs,—difficulties, the solution of which is necessary to their full understanding and realisation, and also, in part, to their artistic appreciation.

As is well known, it is the intention of the Prussian Archæological Institute to collect together in one vast corpus all the available material, *i.e.*, the whole series of Attic grave reliefs. Till this is done no doubt a number of important parts must remain obscure, but fortunately we need not wait for the completion of this important work to lay down broadly the outlines of interpretation, though these may leave a wide margin for future annotation and correction.

If we desire to understand the meaning of the later and finer reliefs (such as 5, 6, 7), we must go back to earlier work (*e.g.*, 1, 3), in which, while the technical dexterity is less, the utterance of thought is clearer and more precise. We have advisedly selected for our series of illustrations, not in all cases specimens of the greatest beauty, but rather such a series as shall exemplify certain tendencies of thought and developments of tradition. We can, in a brief article, only summarise certain conflicting views, and register what we believe to be the present high-water mark of archæological opinion. Those who desire a fuller conspectus will do wisely to read two papers on the subject, to both of which we and all who subsequently write on the subject must be deeply indebted:—(1) A paper on "A Sepulchral Relief from Tarentum," in vol. v. of the *Hellenic Journal*, by Professor Percy Gardner, who, in connexion with one particular monument, takes occasion to discuss the interpretation of the whole class to which it belongs; (2) Dr. Furtwängler's introduction to "La Collection Sabouroff,—Sculptures." In these two papers will be found references to the whole previous literature of the subject.

Fig. 1.

We turn to the first of our reliefs (fig. 1), a monument in itself quaint and curious enough to awaken curiosity. This relief is the earliest in style, the finest and the best preserved of a series of similar slabs found in 1877 in the neighbourhood of Sparta, a little to the south of the village of Chrysapha. It once formed part of the Sabouroff collection, and was bought by the Berlin Museum with the rest of the Sabouroff marbles; a cast of a similar relief, but of inferior workmanship, can be seen at South Kensington (cat. 20). The subject is clear enough. Two colossal seated figures are depicted, the front one of which, a man, turns full face and holds a wine-cup of the shape known as a kantharos. By his side is seated a woman who draws her veil about her with a gesture of natural modesty very frequent in early Greek art. She wears the peaked shoes of Asia Minor, the man wears sandals. Behind the throne-like chair a bearded serpent uprears itself. To the seated pair two small figures approach, a man and woman, the man bears a cock and an egg, the woman a flower and a pomegranate; these details are hardly discernible in the small-sized illustration here given, though obvious enough in the original. The technique of this remarkable relief is so peculiar that it is impossible to pass it over in silence, though it is the meaning of the scene depicted that chiefly concerns us. The whole design is worked strictly in profile with the exception of the face of the seated man, which is turned full and which thereby dominates the whole relief. He seems to look not at the figures that approach but at the spectator. Further, and this can be well seen on the South Kensington cast, the design is cut in a succession of flat, superimposed planes, not modelled. It in fact suggests the technique of wood, not of stone. We turn to the interpretation, and first it is important to note the place of finding. The relief was found standing erect on a tumulus composed of earth and stones, and near to it was found a slab inscribed Ἑρμανος, "of Hermes." There can be little doubt, therefore, that the enclosure was sacred to the Hermes of the lower world, the Chthonic Hermes. The symbols represented point also to the lower world; the serpent, cock, pomegranate, egg, and the dog and horse, which in certain instances appear, have all to do with the worship of the infernal deities. By what name precisely we are to call the seated couple it would be hard to say. The more mythology is studied the more clear it becomes that gods and goddesses, whose functions were almost exactly identical, were locally worshipped under different names; nay, indeed, that even in the same locality, owing to the importation of other cults, the same god could have two different names. In all parts of Greece we find a divine pair ruling over the lower world: the names of Pluto and Persephone were most widely adopted, but we have also at Eleusis two Chthonic divinities known only under the general terms of "The God" and "The Goddess" (ὁ θεός and ἡ θεά). We have also Zeus Chthonios and Ge Chthonia, and at Athens the cult of Neleus and Basileia; at Hermione we have Klymenos and Chthonia. We must, therefore, leave the precise names of the Chthonic couple undetermined, only being sure that they represent the double power, male and female, that in the lower world, by analogy with the upper, rule humanity.

But we are not at the end of the interpretation. If the relief here represented stood alone, the mythological meaning might suffice; but among the other analogous monuments are some which demand further elucidation. In one, notably, a dog springs

up against the knee of the seated figure, two others are inscribed with the names of mortals, Τιμοκλης and Αριστοκλης. Here we can scarcely suppose that deities are represented, and so a fresh perplexity is added. Perhaps if literature did not step in to help us, the right solution could never have been found. The seated figures are, in fact, in one way mortal, in another divine: they represent the *dead heroised*,—ancestors who are figured under the semblance of gods of the lower world. The Egyptians believed that the soul of the pious man was made in some mysterious way one with Osiris; and the Greek believed his dead ancestor ruled as a very living and real divinity in the world below. Alcestis when she died became "a blessed daimon," powerful to answer prayer. Her tomb was,—

"Like the gods
Honour'd, a veneration to a world
Of wanderers. Of the wanderers struck thereby,
Who else had sail'd past in his merchant ship.
Ay, he shall leave ship, land, long wind his way
Up to the mountain summit, till there break
Speech forth, 'So this was she, then, died of old
To save her husband. Now a deity
She bends above us. Hail, benignant one!
Give good!"

because chronologically it is nearest, but because it illustrates a further development of the same belief. The marble of which the slab is made is Pentelic, but from the style it is presumably the work of a Bœotian sculptor, and it dates about the middle or end of the fourth century B.C. It belongs to a class of monuments not set up over tombs, but dedicated within the precincts of the burying-place. It is, in fact, a memorial tablet offered to the gods of the lower world. Such tablets were either fixed in the wall of the shrine or erected on a pillar. This one, evidently from the form, stood on a pillar, in the way frequently depicted on painted vases.

The analogy with the preceding monument is obvious. We have the heroic couple and the procession of miniature worshippers. The man, however, no longer simply holds a kantharos, he is regularly engaged at a banquet. He lies Ionian fashion, his wife is seated by his side. A slave boy attends to draw wine from the amphora. Near the couch is a table heaped with the little, conical cakes, probably those which went by the name of "pyramids." Here, again, we have a mingling of the human and the divine, but the human seems to be getting

come to determine the order of priority, it is more likely that this element of the banquet was transferred from heroes to gods than *vice versâ*, at least the custom of *libation*, *i.e.*, pouring wine *on the ground*, can only have arisen in connexion with Chthonic cults. The tablet we have selected is again only one of a large series,—the same in type, but varying in detail,—and offering in many instances difficulties in the minutiæ of interpretation into which we cannot now enter.

So far the two series of monuments we have considered have this common principle as the basis of their designs, that tney represent the dead man *as he is supposed to be after death*, *i.e.*, in heroised form with divine attributes and functions. We may say in passing that on the whole this manner of representation is characteristic of the Dorian stock. We now pass to a series of monuments actuated by another motive, *i.e.*, the desire to represent the dead man *as he actually was during life*, but as we shall see, this class, in the main Ionian, could not be rightly understood without realising the meaning of the other; the most simple, human, and naturalistic of the second series are yet tinged with some flavour of the

Fig. 2.

Fig. 3.

Nor was this any special canonisation, the meed of notable virtue; it was the ordinary state of the departed,—conceived of as mysteriously powerful because beyond the sphere of sense. Artistotle says the dead were reckoned as having become more powerful (κρειττόνων ἤδη γεγονότων). Plato (Laws, xi., 927) says that "the souls of the dead have the power after their death of taking an interest in human affairs," "and therefore, men should have a fear not only of the gods above, but in the second place of the souls of the departed." It would be easy to multiply references of this kind. It is enough if we grasp the fact that the departed ancestor of any family of note became a sort of god, and was worshipped with a cult carefully prescribed and handed down from generation to generation. His tomb became a shrine, to which the pious descendant brought his offering. It was this ancestor worship that gave rise, no doubt, to many a local divinity, and it is this ancestor worship that is represented in the Sparta reliefs. The two tiny figures are the pious descendants who, no doubt, offered the relief with the double purpose of commemorating their ancestors and appeasing those Chthonic deities,—by whatever name they were called,—whose functions were in part shared by the dead man and his wife.

Our next relief (fig. 2) takes us a step further in the same direction; we take it next not the upper hand. But for the crown on the reclining hero's head, and the approaching worshippers, the banquet might be that of a mere mortal. The cakes, indeed, have a somewhat sacred air, as this shape of cake is supposed to have been offered to Demeter. It is, in fact, the old story, the mortal conceived of as a god after death; the gods loved feasting, so the dead man when he is a happy daemon will feast at will. Plato (Laws, ii., 363) is severe on this widespread and comfortable faith. He says:—"Still grander are the gifts of Heaven which Musæus and his son Eumolpos offer the just: they take them down into the world below, where they have the Saints *lying on couches at a feast*, everlastingly drunk, with garlands on their heads: their idea seems to be that an immortality of drunkenness is the highest meed of virtue." We are not concerned here with the morality of this heaven, though no doubt, being a conception perfectly honest and genuine, it was cogent as a motive power. What we have to notice is, that this feast of the beatified is only another evidence of their deification. It was part of the regular worship of certain gods, notably the Dioscuri and Æsculapiios, who all of them are of the nature of god-heroes, that a table (τράπεζα) should be spread for them, and a couch prepared for their reclining; then when they had well eaten and well drunk, they were easy to be entreated. It seems probable that if we heroising faith,—the types of the two series act and counteract on each other.

This is admirably seen in the monument selected for our third (fig. 3) illustration. It is the so-called "Leucothea" relief, from the Villa Albani; where it was found is unknown, but it is probably a piece of Attic work. The older school of interpreters, who were keen to scent mythology everywhere, held that it represented Leucothea nursing the infant Dionysos. But certainly no mythological interpretation is needed; it is a human mother, not a goddess, who with large tender hands takes her youngest born upon her knee and holds him,—a charming touch of realism,—at just a little distance that she may the better see the face which to her, at least, is lovely. It is a maid-servant, not a nymph, who waits with the elder children till the mother has looked her fill. Beneath the lady's chair is a work-basket of ancient pattern, for she is thrifty matron as well as loving mother. It is, however, instructive to note that the mother was mistaken for a goddess: she is seated in a chair of regal splendour with arms to it, always a note of dignity, and a foot-stool; if she were to rise to her feet she would overtop the maid-servant by nearly one-half, and though this may be due to the general principle of isocephalism so carefully observed in the best Greek reliefs, yet it denotes also exalted rank. What, however, is most suggestive for our purpose is to

compare this relief with the Spartan stele (fig. 1): manifestly they are the same *in type*, in art form; the seated regal figure, the approaching procession; but the severe hieratic ritual of god and worshippers has melted into the humanity of mother, children, and maid; it is the old form touched with a new meaning. This is the history of countless of the loveliest Attic compositions, an old Doric type softened into Ionian grace, an austere dogma transfigured into a human truth. Spoken of as one isolated instance, this may seem fanciful, but we venture to say that the more deeply Greek art is studied the more this traditional element is felt,—this habit of keeping the old form and informing it with a new spirit.

Fig. 4.

Fig. 5.

In a large number of reliefs the purely human element alone appears; thus in our fourth instance (fig. 4) we have the simple figure of a citizen leaning on his staff, a lekythos for his anointing on his wrist, and his dog beside him. There is nothing of the god here. This stele now stands in the Naples Museum, much disregarded, quite unphotographed (except by ourselves), a pure bit of early Greek work among a host of vulgar Græco-Roman reliefs. The modelling of the figure is obviously imperfect, specially in the right arm, but no one will deny that this very simple composition has the charm of a perfect sobriety and serenity. It is surmounted by an akroterion of great beauty. Looking on to the stele in figure 6, we may see how this architectural form of decoration speedily became corrupted by the introduction of a certain degree of naturalism. We may say in passing that these akroteria are of the utmost importance in the classification and dating of the stelæ, and also of no small interest in connexion with the history of the Ionic and Corinthian capitals, but such questions are beside the purport of the present paper. It may be also suggested that in the dog who so frequently appears on Attic stelæ we have a sort of echo or reminiscence of the symbolic, sacred dog who appears in the early type forms; not that he has here the smallest symbolic meaning, but that he was part of the traditional stock-in-trade of the grave relief-maker, and therefore apt to appear where he could appropriately be worked in.

Very similar in general conception to the Naples stele is our fifth instance (fig. 5), a monument found at Karystos, in Eubœa, and now in the Berlin Museum. It once formed part of the Sabouroff collection. The most superficial critic will see at once its likeness to the style of the Parthenon marbles, and we have included it, not from any special interest in its interpretation, but for its intrinsic beauty, and because it shows more conclusively than any *à priori* reasoning how widely felt was the influence of Pheidias.

Our last two instances have been long, narrow stelæ, with one figure only, and such compositions seem to have been much in favour in the early part of the fifth century. They are singularly dignified and singularly unemotional. As a rule, they are purely human in intent, but sometimes, as where a maiden holds a dove, or a youth a cock, it is hard, indeed, to say whether there be not latent some notion of deification. Often, in all probability, the sculptor was as little clear on the matter as we are. We turn, last of all, to two monuments (figs. 6 and 7) both of great beauty, and which open up quite a new field of inquiry.

Fig. 6.

We take first the simpler composition (from a stele in Berlin), fig. 6. We have represented here husband and wife, Meneas and Menekraleia, clasping hands. The form of the letters dates the monument as belonging to the first quarter of the fourth century B.C. The drapery is distinctly post-Pheidian, especially the fold of mantle thrown over the wrist of Meneas. The drapery also of Menekraleia shows that tendency to swirl the folds about the body which is very different from the august but somewhat non-natural schemes of

Fig 7.

Pheidias. In fig. 7 the central notion is the same; husband and wife again clasp hands, but the scene is amplified by the presence of a mourning attendant, and the style is grander and bears more of the stamp of the individual artist. The two principal figures, husband and wife, are inscribed Thraseas of the deme of Perithoidai and Euandria. The head of Thraseas is ideal, but with a touch of portraiture about mouth and nose. He is dressed in the simple himation, leaving the breast exposed; in the original the working of the skin is beautifully executed, both on breast and arm, and the wrinkles of the hand-joints almost overstep the limits of permissible realism. The rendering of the maid-servant's head and figure are very remarkable. She is a subordinate figure, and yet, by the accident of a traditional composition, she occupies the central position. Fearing that she may distract the spectator's eye the artist has literally only sketched her in, and she has quite the effect of being in a back plane, and yet the face is perfectly expressive and the sorrowful look is obtained by very simple means, by a prominence of the upper lid and a depression of the inner corner of the eye.

What is the action intended? Most people, at first sight, would say the parting of husband and wife, the visible image of the supreme χαῖρε. Such was long the current interpretation; but there are obvious difficulties: both husband and wife are dead, their names are conjointly inscribed; further, it is noticeable that in these so-called "parting scenes" all expression of grief is confined to the subordinate figures,—slaves, attendants, and the like. Here, notably, only the maid-servant droops her head in grief, husband and wife look face to face with perfect serenity. Some would argue this is only the ideal calm of the thoroughbred Greek, and, indeed, this point is no doubt one to be considered. Whatever they felt, the Greeks disliked *in art* a rude exhibition of emotion; but this is not the real clue to the mystery. The scene intended is the χαῖρε of meeting, not the χαῖρε of farewell, the eternal all-hail of husband and wife. It is doubtful whether, in the best days of Greek taste, a sculptor would have allowed himself to depict on a funeral monument a scene of such vivid suffering as that of the earthly parting; to them, as to us, the supreme fact of life was companionship, and the supreme loss of death parting.

"Here we suffer grief and pain,"

the hymn says, and with a fine transition from the general to the poignant particular

"Here we meet to part again;"

but all that the Greeks felt or that we feel is not meet for expression in art of the monumental kind, and they figured, therefore, here again as in the old Spartan stelæ, what *was to be*, the meeting in Hades: "in their death they were not divided." The slave might mourn; he was left behind, of no account, above or below; but the husband and wife are serene with clasped hands, for love is stronger than death. So it seems to us now in looking at this ancient gravestone, and probably, in fact, what happened was something of this fashion. The wife died, perhaps, first; her image was set up and her name engraved, and they made her seated on a chair after the pattern of the older lower-world goddess, and as the husband knew that he too must follow soon, he bade the sculptor make a gravestone with the two together, only his name was not graven yet awhile. Perhaps they planned it together before her death, and it comforted both their hearts with that strange mixture of faith and sentiment which humanity at all times finds so sustaining. We have to remember, indeed, that with the Greeks in the case of husband and wife love was far more of a social instinct than a romantic sentiment; but of whatever nature that love might be, we have in these gravestones with the clasped hands the image, not of severance, but of marriage for all time.

In conclusion, it is most necessary to guard against the supposition that the two several ways of regarding the dead man on his monument were *successive* developments. They subsisted side by side,—the one, perhaps, that of the people, the other of the educated few; the one obtaining ultimately on votive commemorative tablets, the other rather on actual sepulchral monuments. We must beware how we tabulate and date the shifting of human conviction, specially before the days when the analysis of sentiment begins. If we could have Socratically questioned the Greek of the fifth century B.C. we should speedily have reduced him to the confession of beliefs logically incompatible,—the fine warp of his reasoned conviction tangled inextricably with a web of materialistic tradition.

b

"THE HEALTH OF NATIONS."

THE two volumes recently published under this title are rather difficult to define. The title-page title is given below.* The outside cover bears the words, "The Health of Nations," in one corner, and "Edwin Chadwick" in another. In the preface Dr. Richardson says that "the author of the works herewith submitted to the public" did him the honour to entrust the publication to his care, leaving the selection and arrangement entirely to his responsibility. The title, "A Review of the Works," suggests that the book is a criticism of Mr. Chadwick's writings by Dr. Richardson. The terms of the preface imply that the book consists of a selection from Mr. Chadwick's writings. It does not appear, however, that either conclusion is correct. The book is really a *résumé*, or what is vulgarly called a "boiling-down," of Mr. Chadwick's writings and opinions upon the various important subjects in relation to sanitary progress and general public well-being with which his name is so indissolubly connected. It takes a little while to find this out, however, when we are put on the wrong scent in two directions at once; and even when we have fairly discovered the principle of the volume, the result is rather confusing. We have a reference to an essay contributed by Mr. Chadwick to the *Westminster Review* of a certain date. The editor, as we suppose we must call him, proceeds to summarise the contents of this essay. The whole chapter is headed "Practice and Progress." The real title of the essay in question was "An Essay on the Means of Insurance against the Casualties of Sickness, Decrepitude, and Mortality," and this is quoted in the preamble of the chapter. Then commences a summary of its contents, interspersed with remarks by the "editor," under the sub-heading "Social History, 1828"; then a summary of another portion under a second sub-heading, "Practical Men," with which the chapter ends. But the next chapter, headed "The Value of Life," is, we find, on reading it, only another sub-heading of the summary of the same essay. Between this illogical arrangement, and the odd way in which what are apparently Dr. Richardson's own remarks are mixed up with Mr. Chadwick's, it is impossible to say which of them we are to regard as the author, and it requires considerable attention to find out at any particular paragraph whether we are reading Mr. Chadwick's or Dr. Richardson's words: in some places it is entirely doubtful. This method, or want of method, renders the book, well-intentioned as it undoubtedly is, a most confusing and irritating one to read. It would have been far more to the purpose to have reprinted entire some of the most important and typical of Mr. Chadwick's writings, with some historical notes as to the circumstances under which they were written.

The "editor" has, however, so far adopted a method that he does classify his subjects under some main headings. The first volume includes, "Political and Economical" and "Educational and Social"; the second volume is devoted to the sections "Sanitary and Preventive of Disease" and "Prevention of Pauperism and Poverty."

From our point of view the work of Mr. Chadwick as a great sanitary reformer is of the most interest, and it is in connexion with sanitation that he had, perhaps, the greatest reputation with the general public, so that Kingsley many years ago proposed in his "Yeast" (a social and sanitary novel) that he should be celebrated in a kind of modern "Æneid," to be called the "Chadwickiad." It appears, however, that it was in connexion with the subject of life insurance that his thoughts were first turned towards sanitary problems. This was while writing the article we have already referred to for the *Westminster Review*, on "The Means of Insurance." He told Dr. Richardson that in the first part of his work he was merely interested in the results of the calculations as they came out in reply to the questions he had formulated from general observation and induction. But as the labour progressed there developed what he termed the "sanitary idea," the idea that man could, by getting at first principles and arriving at the causes which affect health, mould life altogether differently, and "beat what hitherto had been accepted as fate."

The earlier fights of Mr. Chadwick in the cause of sanitation took place so long ago that at the present moment his name may be little familiar even to some who are unconsciously following in his steps; and he has, perhaps, had less reputation than most men who have done so much useful work, from his not being specially connected with any one line of work. As Dr. Richardson said in a paper he wrote in the *Social Science Review* five-and-twenty years ago, Mr. Chadwick made laws, but was not in the Legislature; did something for sanitation, but was not a doctor; had a hand in education, but was not a schoolmaster; and Dr. Richardson then prophesied that the future biographer of this man would be at a loss to classify him. It is, perhaps, in kindness to the future biographer that this *résumé* has been brought out. The doctor's own opinion of his hero's work is summed up in the title he has chosen for his book,—"The Health of Nations," selected inasmuch as there was nothing advanced in Mr. Chadwick's writings which did not bear on the happiness and well-being of the people. That is true; and, perhaps, the best definition of Mr. Chadwick's part in modern life would be to say that he was a great social and sanitary reformer.

The greater portion of that section of the book in vol. ii., which deals with sanitation and the state of dwellings, is extracted from the Report on the Sanitary Condition of the Labouring Classes of Great Britain, prepared by Mr. Chadwick as Secretary to the Commission of Inquiry, appointed in 1839, as to the causes of disease among the labouring classes of the metropolis and in other parts of the kingdom. Dr. Richardson extracts many chapters, in his own confused fashion, out of this Report, and it is singular to observe how very modern some of the remarks, made not far from fifty years ago, appear even at the present moment; in other words, how much the writer was in advance of the general knowledge and perceptions of his own day. Most of the propositions which have now passed into articles of sanitary faith are found stated here; and occasionally, on the other hand, we are struck by remarks in regard to the circumstances which originate disease, which remind us that this was half a century ago, and that proceedings now universally condemned were then the ordinary every-day way of doing things. The following passage is at least satisfactory as an indication that we have made some progress:—

> "The sewerage of the metropolis, though it is a frequent subject of boast to those who have not examined its operations or effects, will be found to be a vast monument of defective administration, of lavish expenditure, and extremely defective execution. The general defect of these works is, that they are so constructed as to accumulate deposits within them; and the accumulations remain for years, and are at last only removed at a great expense and in an offensive manner by hand labour and cartage. The effect is to generate and retain in large quantities before the houses the gases which it is the object of cleansing to remove. . . . It may be mentioned as another instance of the absence of appropriate knowledge that has governed these structural arrangements that a large proportion of the most expensive sewers are constructed with flat bottoms. In proportion as the water is spread the flow is impeded, and the deposit of matter it may hold in suspension increased."

It is curious to read this now. One would have imagined that, apart from anything that could be called scientific study of the subject, ordinary observation and common sense might have warned men against flat-bottomed drains for a drainage carrying solids in suspension. But so it is; a thing is obvious to one generation which was quite overlooked by the preceding one; and that many facts in regard to drainage are obvious to every one now is in a great measure to be attributed to the influence of the man to whom they were equally obvious fifty years ago.

The further chapters in this section of the subject deal with the condition of "Streets and Pavings," next "Water and Health," in the course of which, by the way, is the record of the fact that at one time there were three different water companies passing through the same streets of a considerable portion of London and competing with each other; of course, with threefold mains and so many separate systems of service pipes. The chapter on Land Drainage and Health is an admirable one, and we quite concur in Dr. Richardson's remark as to the simplicity and force with which the points are brought before the reader. "Ventilation and Work" includes a description of a tailor's work-room at that period, from which there is little doubt Kingsley took his description in "Alton Locke." "Overcrowding in Private Houses," "Medical Officers of Health," "Common Lodging Houses," and "Sanitary Dwellings for the Wage Classes" are among other branches of the subject which were treated of, and which form chapters in the present work. In the last-named chapter is a significant fact which might have its practical application now. In certain emigrant ships there were very bad sanitary conditions and very high death-rates till it was determined to contract with the owners not for the number shipped, but for the number landed alive and well at the end of the voyage. The effect was most striking; the shippers improved their sanitary appliances, and engaged officers of health to take care of the passengers, paying them also "by results." "By these contracts we ensured to every poor passenger affectionate attendance, and at least one sincere mourner if anything happened to him." The result was the lowering of the death-rate by one-half. "A War-ship's Worth of Sanitation," a consideration of what could be done with the cost of one first-class man-of-war towards improving public sanitary conditions, is another point in this portion of the work. The chapter on the disposal of the dead is of interest; and in connexion with this subject it is worth while to mention a letter from Carlyle to Mr. Chadwick, in 1850, in which the Chelsea philosopher states, in his own characteristic manner, his long-felt approval of cremation as the most rational means of disposal of the dead.

The book, unsatisfactory as it is in form, should be read through by those who are interested in the subjects of which it treats, as giving information as to the history of a very important branch of modern progress, and of the part played by one determined and practical man in promoting it. Dr. Richardson admits that his friend evinced neither oratorical nor literary gifts in his statements of his theses by word or by pen; but he impressed you as a writer who always had carefully prepared facts behind him to justify all his conclusions; and of his determined attitude in pressing his convictions a dramatic idea is conveyed in a quotation from a semi-humorous article in the *Daily News* of August 19, 1846, referring to his evidence before the Poor Law Commissioners:—"Chadwick stands alone, dark and terrible as Milton's hero, confronting the whole three Commissioners, who are waxing more and more vehement," the evidence not being to their minds. And, indeed, Mr. Chadwick has never been one to incline to that time-honoured Governmental request, "Prophesy unto us smooth things, prophesy deceits." He may claim the distinction of having probably told more disagreeable truths than any Englishman of his generation; and he has had the satisfaction of living to see most, if not all of them, admitted and acted upon.

A Big Walnut Log.—The *Glasgow Herald* says that there was recently landed *ex* S.S. *Lord O'Neill*, from Baltimore, U.S., one of the largest logs of black walnut imported into the Clyde. Its extreme measure is 17 ft. long, 42 in. broad, containing over 200 cubic feet calliper measurement. To those interested in trees it will not only appear a rare but also a valuable specimen. It has been consigned to Messrs. Allison, Cousland, & Hamilton, timber brokers, of Glasgow.

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* The Health of Nations: a Review of the Works of Edwin Chadwick; with a Biographical Dissertation. By Benjamin Ward Richardson. London: Longmans, Green, & Co. 1887.

NOTES.

WE referred last week to the question of the ventilation of the proposed Channel Tunnel. As a matter of expense, this is no inconsiderable item to be carried to the debit of working cost. But there is a much more serious question than that of the cost of ventilation. It is one which the advocates of the tunnel, whether scientific or otherwise, have conveniently left out of sight. This is, the degree to which the capacity of the tunnel for transport is limited by the fouling of the air by the consumption of coal. That limit, so far as our present engines for locomotive traction are concerned, is very narrow. We cannot put the weight of pure carbon that would be burned by an engine fitted for the tunnel service at less than 20 lb. per mile, and probably this estimate would prove far too low. But this consumption would liberate 73 lb. of carbonic acid gas per mile. A mile of tunnel will contain about two million cubic feet of space, or 160,000 lb. of air. The passage of two trains, whether following or crossing, through a mile of tunnel, would thus raise the proportion of carbonic acid gas from the normal rate of 4 in 10,000 parts, to that of 1 in 1,000 parts, which is not fit for respiration. In addition to the gas from the fire would be that formed by the respiratory process of the passengers. Thus, after the passage of every two, or at the outside three trains, the tunnel would be impassable in safety. Ten miles an hour may be taken as the practical limit of speed of an air current for ventilation; so that an interval of at least two hours must be allowed after each pair of trains to renew the air. Increasing the weight of the trains in order to reduce their number will not much mend the matter, as the consumption of fuel, and the formation of gas, increases with the weight of the train. Supposing, then, the impurity of the atmosphere not to be more than the proportion at which delicate persons begin to succumb, and that the ventilating apparatus is in good order to produce a current of air at the rate of ten miles an hour, the capacity of the tunnel will allow for the passage of twenty-four trains in the twenty-four hours, or about half the average frequency of the trains on the railways of the United Kingdom. How is the line to pay?

THE proprietors and lessees of theatres seem minded to make the best of the occasion of the late dreadful disaster to advertise each the safety of his own theatre, and the special provisions for the safety of the public which each has made, or is about to make. We have these confidences after every theatre disaster; and in general they are very much a repetition of the same statements as have been made on each previous occasion. Mr. Pinero is, however, entitled to the credit at least of novelty, in his proposal that before the curtain rises every evening the proprietor should come to the footlights and make a speech explaining to the audience the arrangements for exit in case of accident. This is a typical example of the wild kind of proposition which is apt to be made, and to find its way into print, when people's heads are full of the danger of theatres. Cannot Mr. Pinero realise that as long as such an address from the manager were paid any attention to, it would be the very thing to alarm nervous old women of both sexes, and put them all on the *qui vive* for imaginary danger, where it did not exist; and secondly, that it would certainly degenerate in a very short time into a mere ritual, to which no one would pay any attention? And if an accident or an alarm did take place, and the audience got into a fright, would they remember directions they had heard, any more than directions that were printed? Not they. Then another wiseacre, Mr. T. A. Brocklebank, writes to the *Times* to ask why the steps leading to the exit door cannot be made to lead *up* instead of *down* to the door, so as to give less encouragement and facility for rushes. It has apparently not occurred to Mr. Brocklebank that one reason against his proposition is that doors are usually, for convenience, made on the ground-level. It is possible to render theatres much less liable to fire than they now are, and it ought to be insisted on (officially) that they should be so; but render theatres as fire-resisting as you can, as we observed last week (and as we perceive, our respected contemporary, the *Field*, urges in a very spirited and sensible article in its last issue), until people learn not to be such fools as to rush into panics, and trample each other to death on the first alarm of fire, no theatre, except an open-air one, will be really safe.

SINCE the foregoing remarks were written, one really important improvement has been announced by Sir George Chubb, in a letter to the *Times* of Wednesday. He states that his firm can now make doors which, while they can be locked so as to be secure from the outside, will give way at once on a push from the inside. This, we have ascertained, is an entirely new device, and is to be put into operation in the new theatre in the Strand, at the instance of the architect, Mr. W. Emden, who is to be commended for the attention he appears to be giving to provisions for public safety in the two new theatres in which he is professionally concerned. The invention is not yet, we are told, quite in a stage for publication, but we shall probably have further information to give in regard to it. In the meantime, however, we may say that, from inspection of a model of the apparatus, we are convinced that it is a perfectly good and efficient means of accomplishing what is desired. The push must be made on a special portion of the framing of the door; but by selecting the central lock-rail as the operating portion, and projecting it a little, no one can lean against the door without its opening as intended.

THE International Congress on Hygiène is to be held at Vienna from the 26th of September to the 2nd of October. Among the subjects of interest to our readers which are to be discussed are various reports, by reporters delegated from last year's Congress, on matters connected with sanitation. Dr. Gärtner, Professor of Hygiène at the University of Jena, is to report on the tests to be used to ascertain the hygienic condition of drinking-water and lavatory-water. "M. le Dr. Frankland, Professeur de Chimie à Yew-Reigate" (so in the programme), will give a report on the purification of sewage discharge in connexion with the question of the contamination of river water; Dr. König, Professor of Agricultural Chemistry at Münster, and Dr. Müntz, Professor at the "Institut National Agronomique" of Paris, will present reports on the same subject. M. Durand-Claye, Engineer-in-chief "des Ponts et Chaussées" at Paris, and Major Humphreys, of Memphis, Tennessee, will present reports on the working of the Waring and Shone systems of ejection. The means for the provision of solar light and warmth to buildings will be the subject of reports by M. Clement, Physician of the Hôtel-Dieu at Lyons; Dr. Knauff, Professor of Hygiène at the University of Heidelberg; M. Trélat, whose name is well known to our readers; and M. Gruber, architect, and Professor at the "École Supérieure du Génie" at Vienna. We have not space to give all the names of readers of papers and reports, but other subjects to be discussed are Instruction in Hygiène at Elementary and Secondary Schools; Isolated Hospitals and their Methods of Construction; Hygiène of Boats, especially those of the mercantile marine; Tests for the Sanitary Condition of Air; and the Use of Lead Pipes (by Dr. Hamon of Boulogne). Professor Corfield contributes a report on the question of some precautions against the spread of infectious diseases, but in general England seems to be taking a very small part in the proceedings. No doubt considerations of locality and language have something to do with this abstention. Vienna is not, geographically speaking, very central.

WHILE we in England are laboriously endeavouring to get money to commence the Manchester Ship Canal, similar undertakings are being carried on abroad with considerable determination and success. The chief one is the Corinth Canal, which is nearing its completion, having been commenced in 1882,—a period of five years. It was intended to have it ready by the beginning of next year, but unforeseen circumstances (as in Exhibitions) have intervened, and so the opening is postponed. Another great work (also in Greece) is the drainage of an enormous marshy district, known as Lake Copais, in Northern Bœotia, which, whatever the κνδος, or money, which the English company, who are the undertakers, get out of it, will give 27,000 acres of profitable land to the Grecian kingdom, and, so far, do somebody good. The opening is also recorded of a canal between Havre and Tancarville, on one of the Seine reaches between Havre and Rouen, with a branch to Harfleur, at a cost of 1,000,000*l*. A new basin of 523 acres, the basin of Du Belloy, connects the canal with the port, and the accommodation is so ample that it is expected that the goods freight between Havre and Paris will be reduced by two francs per ton.

THE catastrophes at the Opéra Comique and that at Exeter have caused a lively discussion in the Berlin press as to the chances of escape of the spectators in the various Berlin theatres in case of fire. The consensus of opinion appears to be that the conditions of escape are fairly favourable at the Opernhaus, the Schauspielhaus, and the Friedrich Wilhelmstadt Theatre, but very bad in all the rest. In the Opernhaus and Schauspielhaus the stalls may be emptied in a couple of minutes through four large doors opening outwards. The same is the case with the pit, at the back of the stalls, which has separate exits, whilst broad concrete staircases offer similar facilities for the occupants of the upper tiers and gallery. The Friedrich Wilhelmstadt Theatre, being quite a new building, deserves special mention. The architect has here paid particular attention to the causes of the Ring Theatre catastrophe in Vienna some years ago. From the gallery two broad concrete staircases lead down to the ground floor, besides which the people in the gallery may, through numerous unlatched windows, opening outwards, descend, by means of iron ladders, to the roof of the first floor, and thence, by a second set of iron ladders, into the garden below. From the stalls five specially-constructed doors lead directly into the garden, besides the two ordinary doors opening on the foyer. Moreover, the scenery and woodwork in the theatre are impregnated with some composition rendering them incombustible. In all the theatres of Berlin there are now iron curtains, and special reserve exits have been added, whilst oil lamps are lighted in all corridors, passages, and rooms during a performance, in case of accident to the gas supply. With the exception of the above-mentioned theatre, however, the rest appear to be as bad as can be. The *Berliner Börsen Zeitung*, in referring to this subject, states that in one theatre two pillars have recently been raised in the stall lobbies with a view to divide the human current in case of a panic, but which will undoubtedly do more harm than good. In another, the lobbies are so narrow, and the cloak-room is situated so awkwardly, that even under ordinary circumstances the spectators have at the end of the performance to stand closely packed for upwards of twenty minutes before they can get out. It would be impossible here for a single individual to penetrate the crowd. In certain other Berlin theatres the spectators can only reach their seats on climbing high, narrow staircases, and in one theatre the corridors and passages form a veritable maze. In consequence of these disclosures, all the leading Berlin journals now demand that there shall be at least two doors on each side of the ground-floor leading directly into the open; that all doors shall open outwardly, and that every tier shall have special fireproof staircases, to be used only in case of fire, leading directly into the open

One journal also demands the entire abolition of stage boxes, and of the boxes slightly raised above the stalls, where such exist. Furthermore, it is demanded that the attendants, box-keepers, and other functionaries, shall be ordered, under heavy penalties, to remain at their posts in case of danger, and not be the first to run away, as was the case in Paris. These men, it is maintained, should be the last to leave the building, and they should offer the public the same example of coolness and courage as a captain and crew of a sinking ship. Finally, it should be the imperative duty of the firemen at all theatres every night to test the working of the water hydrants and the telegraph, and see that all doors intended for exit are unlocked. It is stated that in all Berlin theatres the iron curtain is tried every night, so that there is hardly any fear of this important protection failing, as was the case at the Opéra Comique, through the rusting of the mechanism. Nevertheless, it has been proposed that the working of the iron curtain shall be intrusted to a man who is seated in *front* of it, and who, by a simple contrivance, is unable to quit his seat until the iron curtain has descended. Such an arrangement seems carrying matters to an absurd length; in short, it is panic legislation.

THE Burgh Engineer and the Firemaster of Edinburgh have been instructed by the Lord Provost to examine the theatres and places of amusement, and to submit to the Town Council, as early as possible, a report of their examination, with any suggestions that may occur to them of improvements to aid in securing the safety of the public. This is, of course, an outcome of the recent disastrous event at Exeter. Similar warnings have been given before, which have caused a like temporary action, productive of no practical result, not only in Edinburgh, but elsewhere. Legislative enactment, stringently carried out, would probably be the most effective measure. Since this was written, Newsome's Circus, in Nicholson-street, has been burnt down, fortunately without loss of life.

AN appeal is made by the Committee for the Preservation of St. Botolph's Priory Church, Colchester, for funds to assist in such repairs as are necessary for the preservation of these beautiful and interesting remains, which have been for some time in danger of falling to further ruin in process of natural decay. Mr. Loftus Brock is the architect who has been consulted, and no one will doubt that in his hands necessary practical work will be combined with every care to carry out repairs without any injury to the archæological value of the remains. In the course of his report on the present state of the remains, and the course to be taken with regard to them, Mr. Brock says :—

"The ruins consist of the piers and arches of the nave, the walling of the west front (the upper portions are gone), the base of what appears to have been a tower at the south-west of the front, of peculiar plan, and the walls of the north and south aisles.

The walling consists of brick taken from some ancient Roman buildings, in more or less of a fragmentary condition, of all sizes and thicknesses, fragments of roofing, and flue-tiles. There are also flint walling and masses of septaria. The whole is put together with mortar formed of poor sand, and it is not too good to resist the action of the elements. It is of very early Norman work. . . . . The church having been unroofed since the siege, the effect of the elements for so many years upon the masonry, composed as stated, has been no more than might have been expected. The ruin is weakened over its whole surface, the joints between the Roman bricks are so open that a rule will pass in more than 6 in. in almost every joint, the masonry of the upper part of the nave-arcade is thoroughly separated from the mortar, parts of the outer rings of the remaining arches have fallen, and much of the remainder is so dangerous that entrance to the ruin must be denied to every one except such as may be willing to use the greatest care in inspecting. Parts of the west front, where there are two tiers of interlaced arcading, have fallen; other portions may be expected to fall at any moment."

What Mr. Brock proposes is to strengthen the piers and supports in some places, to exclude the passage of wet through the walling by grouting the loose masonry on top, and afterwards covering it with a mass of cement concrete spread to a slope to throw off the wet; to rebuild the portions of the arches which have recently fallen, in order to increase the lateral support; to cut out all loose portions of the walling, and to replace the same stones and brick in their original positions; to repoint the whole of the surfaces; to cover over the small remaining piece of vaulting to the south-west tower with cement concrete. Shores have been applied, and some of the missing parts rebuilt solidly in cement; but the heavy work necessary to be done to the nave-piers, and to secure, in part, the west front, have, however, exhausted the funds at the committee's disposal; the pointing of the front has hardly been commenced, and the operations are at a standstill. Subscriptions will be gratefully received by the Rev. T. R. Corbett, Colchester, the Treasurer to the Preservation Committee.

DR. DÖRPFELD'S discovery of the older Athene temple in the Acropolis raises a host of questions which the discoverer himself is the first eagerly to discuss. The *Mittheilungen* of the German Archæological Institute at Athens publishes, side by side in the same issue (xii.), with delightful frankness, two papers, one by Dr. Dörpfeld, the other by Dr. Petersen, embodying views diametrically opposite. Dr. Dörpfeld starts the interesting hypothesis that when allusion is made to the "old temple of Athene" (ὁ παλαιὸς ναός or ὁ ἀρχαῖος ναὸς) the reference is not, as has always been supposed, to the Erechtheum, but to his own newly-discovered temple. Further, he thinks that the ὀπισθόδομος, the back chamber in which the bulk of the State treasure was kept, belongs to this earlier temple, not to the Parthenon. It is still more startling to hear that Pausanias actually saw and (in a partially corrupt passage) noted this temple. Dr. Dörpfeld gives a map, in which he marks the exact route taken about and up to this temple. Dr. Petersen will have none of this. The two papers deserve, and are sure to receive, much attention from Classical scholars as well as archæologists proper.

THE last number of the *American Journal of Archæology* (III., pl. xiii. and xiv.) devotes two beautiful coloured plates to the illustration of the Dieulafoy excavations, to which we recently drew attention. The monument selected is the remarkable enamelled frieze of Persian warriors. The explorer himself thinks we have in this frieze a representation of the famous body of troops known as the Ten Thousand, who were also called, Herodotus tells us (vii., 83), "The Immortals," for the following reason :—If one of their body failed, either by the stroke of death or disease, forthwith his place was filled up by another man, so that their number was at no time either greater or less than 10,000. Herodotus goes on to say that these Persians were "adorned with the greatest magnificence; . . . . besides their arms, they glittered all over with gold, vast quantities of which they wore about their persons." Certainly the dress and accoutrements of the warriors of the frieze is of striking splendour and of excellent decorative effect. No idea of this effect can be obtained from any but a coloured reproduction. The warriors are depicted in profile. Each one carries on his left shoulder a bow and large quiver, elaborately decorated. The dresses are all cut of the same pattern, but very various in colour,—some gold embroidered with yellow or green starlike flowers, others white with various coloured stars. The low boots are gold or blue; the head-dress uniformly green. The plates are accompanied by a letter from M. Ménant, describing the excavations in general. The same number of the *Journal* has a paper by Dr. Waldstein on the school of "Pasiteles." He brings some additional arguments for referring the Venus Genetrix and the Esquiline Venus to, if not Pasiteles, at least some sculptor of the Pasitelean manner. Greek art is this time somewhat slenderly represented. Out of seven original articles four are devoted to Oriental matters. One of these papers treats of "Forgeries of Assyrian and Babylonian Antiquities." If the plates given are really facsimiles of such forgeries American buyers must be easily cheated. The paper would have appeared more appropriately in some purely popular journal. Mr. Frothingham's discussion of "a proto-Ionic capital and bird-worship," though it mainly concerns an Oriental cylinder, is of great interest, not only from the point of view of architecture, but also from the light it throws on the origin of an art form frequently found on Greek vases, *i.e.*, the Ionic column surmounted by a bird, raven, harpy, or siren.

IN reference to recent controversy about the age of the walls of Chester, we hear that, at a meeting of the Town Council of Chester on Wednesday, at which Sir Jas. Picton and Sir Henry Dryden were present, a letter from Mr. Arthur Cates was read suggesting that the wall on the Roodee should be entirely cleared for its whole length and the foundations carefully examined. Sir Jas. Picton addressed the Council in favour of the proposal, and said it should be regarded as a matter of national interest and one for which a public subscription might very well be opened. He did not consider that the citizens of Chester were fairly to be called upon to spend their money in finding antiquities for other people's study and interest, though, of course, they might contribute their share. Sir Henry Dryden, who, we may assume, did not oppose such a movement, entered, however, a very requisite caution as to the necessity of protecting the work from the weather if it were uncovered. The Town Council appear, from the report that has reached us, to have been entirely in favour of facilitating such investigations, so that we may expect to have further information in regard to Chester walls before long.

A CORRESPONDENT writes: — "Mr. William Nelson, of Edinburgh, publisher, died at his residence, Salisbury Green, on the morning of Saturday last. He was a man of very cultivated taste, and his picturesque house, overlooking the Queen's Park, and commanding a view eastward to North Berwick Law and the Bass Rock, was stored with beautiful works of art; but he was far from being selfish in his love of the beautiful, and desired that others should share it. To him the City is indebted for various improvements, among others for the restoration of St. Bernard's Well and the adjoining grounds, and for the restoration of the ancient buildings in the Castle at present in progress. It appears that a few days before his last illness Mr. Nelson signified his approval of the finished drawings for the restoration of the Parliament House in the Castle, prepared by his architect, Mr. H. J. Blanc, and gave him instructions regarding certain proposed additions to St. Margaret's Chapel. The Argyle Tower is now almost ready to be handed over to the authorities; it has been restored in a very satisfactory manner. Although a public benefactor, Mr. Nelson shrank from publicity, and refused honours which were offered to him, preferring the pleasures of home to the allurements of office. He was most generous in his dealings with his *employés*, looking after them during sickness, and not losing sight of those dependent upon them in the event of their being overtaken by death."

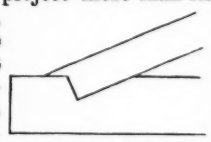
THE *Albert Fine-Art Album*, of which two or three numbers have been sent to us (no publisher's name), appears to be a collection of a series of designs by Mr. Sopon Bezirdjian, whose name appears on the title-page, and who apparently is designer and publisher also. He states that "his object is to introduce to this country, and to the West generally, a pure knowledge of and taste for the best forms only of Oriental art." This is a rather ambitious mission, and we do not know whether we could accept all the designs in the numbers before us as representing the best forms only of Oriental art. In some of them the colour is very crude. Most of the designs, however, show good draughtsmanship and some originality. But Mr. Bezirdjian is under two misconceptions:

in the first place, there are a good many artists and architects in England who know, at all events, much more about Oriental design than he seems to be aware of; and secondly, what those who are interested in Oriental design want is not original designs made for the purpose of publication, but fine illustrations of the best types of existing work. If Mr. Bezirdjian will give them that, he will be more likely to find a public for the *Albert Album*.

THE "Goat in Boots Tavern," No. 333, Fulham-road, at the corner of Park, once Lovers' Walk, is about to be rebuilt from the designs of Mr. T. H. Smith. Messrs. Turtle & Appleton are the contractors. The story of this sign, in its later guise a relic of Morland, is not a little curious. The tavern stands in what some thirty years since was known as Little Chelsea Village. In 1663 a house here was known as the Goat at Little Chelsea; and until the year 1713 it had the right of commonage for two cows and one heifer on the neighbouring Chelsea Heath. The original sign of the Goat is said to have been painted by James Christopher Le Blon, a Fleming, who is believed to have died, 1740, in a hospital at Paris. In the early part of last century a favourite sign for post-houses was that of Mercury with the legend "Mercurius Is Der Goden Boode." The words "der goden boode" became corrupted into "The Goat in Boots." The story goes that Morland, employed by mine host to re-paint this particular sign-board in lieu of discharging his drink-bill, equipped the goat with a whip, hanging-sword, jack-boots, and spurs. The sign-board has been painted again with tawdry embellishments, so that little or none of Morland's handiwork appears. There is one other tavern of this sign in London, at Stanhope-street, Euston-road.

THE neighbourhood of Annan, in Dumfriesshire, has become celebrated of late years, not only in the United Kingdom, but in America, for the red and pink sandstones raised in many large quarries there. We had occasion to allude to this fact in describing the "Red Corsehill" stone last year (see the *Builder*, vol. li., 1886, p. 894). We have now before us a sample from the Warmanbie Estate Quarry, also near Annan, on which our opinion has been asked. It is a very fine-grained red sandstone, of the age known to geologists as Triassic or New Red, and is made of minute particles of quartz, which in themselves are practically imperishable. The first question in such a case is, What is the nature of the material (if any) which binds these particles together? For on this almost the whole of its weathering properties depend. In the case of many stones this could not be ascertained without a microscopical analysis, but here the semi-conchoidal fracture exhibited by the stone shows at once that silica is one of the cementing materials; whilst its red colour, its aspect, and the freedom with which it can be cut, equally demonstrate that it is also bound together partly by peroxide of iron, and partly by compression. Of these, the last-mentioned is the least desirable qualification, the first being a very good one. The silica existing as a cementing material is secondary in origin, and although it is not so durable as the crystalline quartz grains which it binds together, it nevertheless is a first-class cement. The stone is not quite such a dark red colour as the "Red Corsehill" which usually comes to the London market, but other tints are no doubt obtainable, as they are in most quarries. When treated with hydrochloric acid it does not appreciably effervesce, and the amount of carbonate of lime must be exceedingly small, that which is present probably existing in a crystalline form in minute particles of felspar. It is very compact, takes a sharp angle, and is apparently very easily wrought, approaching in this respect the limestones.

AN exhibition of work done by the students who are taught at the Polytechnic Institution, which has been held during the last few days, was advertised as one which "should be visited by all who are interested in technical education." As we observed last week, the teaching of special trades is not what we should define as the object of "technical education," properly so called; and as far as the evidence of results goes, it is the teaching of trades, or special kinds of manufacture, which is carried on at the Polytechnic. But there seems to be a good deal of useful and instructive work done. Among the exhibits we observe there are working drawings of building construction, plans and sections of houses, drawings of brick-bonding, and various details of iron construction. It does not appear, however, that the models for the teaching of this class of work are all irreproachable. It is clear that there are model drawings of some kind, as the same section of cornice is repeated by two different workers in their detail drawings, and shows the cornice stones most insufficiently bedded, in comparison with their projection: a cornice should never project more than its bed on the wall. Then, again, it can hardly be said that this is the most scientific method of forming the abutment of a principal rafter on a tie-beam, but it appears to be passed by the authorities. The wood-carving work is good, and some of the plaster modelling that is shown is also very creditable. In the same room we observed a model of a hot-water circulating system for a house; good, only that there are two nearly horizontal lengths in the flow-pipe, a thing to be avoided if possible, as it checks the flow. The models of a king and queen post roof, near this, are deficient in that the method of framing is not shown in a workmanlike manner; the pieces are put together and painted over, so that it is impossible to see if the joinings are properly made or not, and it looks rather as if they were not, in which case the model is only a toy. Among the exhibits in the down-stairs room is a really admirable piece of work, in the shape of a bicycle, built by one of the students. Art handicraft seems to be the department least cultivated; we noticed a metal coffee-pot, "hammered work": very good workmanship, but bad and inelegant in form, totally without artistic spirit; and the same thing struck us in regard to other manufactured articles. Wood-carving, as an object in itself, is carried out with considerable taste and feeling; but applied art seems to be neglected or not understood.



FURTHER NOTES BY AN ENGLISH ARCHÆOLOGIST IN BRITTANY.*

WEDNESDAY, August 17th, was perhaps the most interesting day of the whole tour made by the party from the Royal Archæological Institute. The gentleman to whom we were indebted for the notes already published sends us the following:—

On account of the tide an early start was necessary, and, punctually by six o'clock, the whole party assembled on the quay of the dock at Vannes to start by the little steamboat engaged to take them to Lockmariaker. Here they were soon joined by the Vice-President and many other members of the Société Polymathique, the President being prevented from attending by a family bereavement. Some of the members of that Society joined the English party, the others following in a second steamer, and proceeded down the Rivière de Vannes for the Morbihan Sea, passing Roquedas, the spot where the jadeite was discovered, the Ile aux Moines and Gavr Innis, both to be visited on the return trip. The two small steamers reached Lockmariaker, in a heavy shower of rain, early in the forenoon. This was almost the only rain the travellers met with during their visit to Brittany. After sheltering for some time until it held up, the members of both French and English societies together went on to the curious twelfth-century apsidal church of Lockmariaker. Outside they were shown an ancient cross with an inscription, said to be yet unread, standing against the wall of the churchyard. After waiting here for a short time, the party was taken charge of by M. Mahé, Inspector under Government of Ancient Monuments in the district, who conducted them to the megalithic remains. It is hardly possible to mention these in detail, but first among them is the great menhîr (vertical stone) named Men-ér-Hroeck. This megalith, now fallen and broken in pieces, must have been, when upright and whole, nearly 65 ft. in length. It has sometimes been said that the pieces now prostrate formed not one, but two menhîrs; but if any of the English visitors had even entertained a doubt upon this point, it must have been dissipated by the examination of the stones under the guidance of M. Mahé and Dr. de Closmadeuc. At Lockmariaker many of the members of the Institute saw for the first time those wonderful marks on the stones of the dolmens which have given rise to so much controversy. On the under side of the Dol-ar-Marchadourien is the outlined figure of the axe, so like the axe used in the present day by the Indians of North America and other aborigines. The horse-shoe shaped, L-shaped, and other usual marks, are found abundantly in the dolmens here, generally in the supporting stones, as also the so-called cup-marks,—little round sinkings in the stone a few inches in diameter. Nearly all the dolmens of this neighbourhood show traces of the tumuli which once covered them, and in many cases, though they now stand exposed, they are surrounded by the *débris* of their mounds. At Lockmariaker there are no alignments of stones, nor are any circles of stones found there; but the menhîrs (upright stones) and the dolmens are the largest in Brittany,—perhaps in the world. The village stands on the site of a Roman city, up to the present unidentified, although the name of Dariorigum has sometimes been assigned to it. It is an accepted fact that in Brittany wherever any large number of prehistoric remains are found Roman remains are found also. Last year the ruins of a Roman temple were unearthed in a garden near the church, some portions of columns and the lower part of an altar being found. Only the last line of the inscription, — the usual votive dedication,—remained, and the visitors were informed that it is the only inscription found at Lockmariaker. It is much to be wished that the upper half, with the name of the deity, may come to light, but at present all excavation is stopped, and the site of the temple has been covered up.

The members of the two societies (English and French) lunched together in the public school in the rear of the Mairie, and were joined by the local clergy and others. After lunch, M. Le Chanoine Le Méné, on behalf of the Société Polymathique, bid the English visitors welcome in the kindest terms, and was seconded by Dr. de Closmadeuc in a learned and eloquent speech. The toast, which was drunk with enthusiasm, was responded to by Mr. Joseph Brown, Q.C., on behalf of the Royal Archæological Institute, who concluded by wishing success and prosperity to the Société Polymathique.

Immediately afterwards the party again took steamer and proceeded to the Island of Gavr Innis, the property of Dr. de Closmadeuc, and there visited a sepulchral chamber, still covered with its tumulus formed of loose stones, in the supports of which are carved the axe-heads and other designs which have been so often published. The axe-heads of this tumulus differ from nearly all the designs on the dolmens of the neighbourhood by being well and cleanly cut in relief, whereas the other markings are merely outlined on the stone. Here is also the channel, some 3 ft. long and 4 in. deep, cut in the supporting stones of the chamber, the use of which is as great a mystery now as when it was first discovered. One thing only can be said, which is that the chamber in the tumulus at Gavr Innis shows that its builders had made an immense advance in the art of using tools over that shown by the builders of the other sculptured dolmens in the neighbourhood. The tumulus was opened in 1832, when several broken hatchets of diorite, &c., were found; some of these are deposited in the Vannes Museum. Some interesting Mediæval remains have also been found in the island. From Gavr Innis the Island of Er Lanic was seen in the distance, where the double circle of stones, in the form of the figure 8, may still be traced at low tide, but is almost lost in the sea.

On the way back to Vannes the party landed at the Ile aux Moines, and there visited the stone circle of Kergonan, the largest in the

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* See p. 358.

Morbihan, but much interfered with by farm buildings erected in the centre.

The morning of the following day was again spent in the Museum at Vannes, when the Curator, the Chanoine le Méné, together with Dr. de Closmadeuc, a second time favoured the visitors by showing them over it and explaining its contents. In the afternoon the party, accompanied by Admiral Tremlett, left Vannes for Carnac and Plouharnel. The sleeping accommodation in these two villages being but very limited, it was necessary to divide the travellers between them. The remainder of the day, with Friday, August 18, and the greater part of Saturday, were spent visiting the megalithic remains, which extend, with occasional breaks, for a distance of some four or five miles from Erdeven (some mile and a half west of Plouharnel) to near La Trinité, east of Carnac. From Mont St. Michel, near Carnac, an immense cairn or tumulus, composed of loose stones, and crowned by a small chapel, the best general view is obtained, and from its summit most of the alignments of stones are visible. This tumulus was opened in 1863 by the Société Polymathique, and at its foot are some interesting remains of a supposed twelfth-century monastery, discovered some years ago by the late Mr. James Miln. The alignments of Menec are those nearest Carnac, and consist of eleven lines of menhîrs, ending near the farm of Menec in a semicircle. A little further on, at Kerlescan, a quadrilateral enclosure of stones has its fourth side completed by a long barrow. There is also a quadrilateral at Courcounno, near Erdeven. The many dolmens bearing sculptures were duly visited; among others that in the park at Kercado, on the capstone of which is a rudely-outlined axe. Many of these monuments have now been purchased by the Government, and will in future be preserved from further destruction; but very many, and among them some of the most interesting, still remain in private hands. These are being broken up by the peasants on all sides, and are used simply as quarries whenever stone is required; in addition to this, much damage is yearly done to the dolmens by careless diggings in the earth at their bases, causing the supports to give way and the capstones to fall.

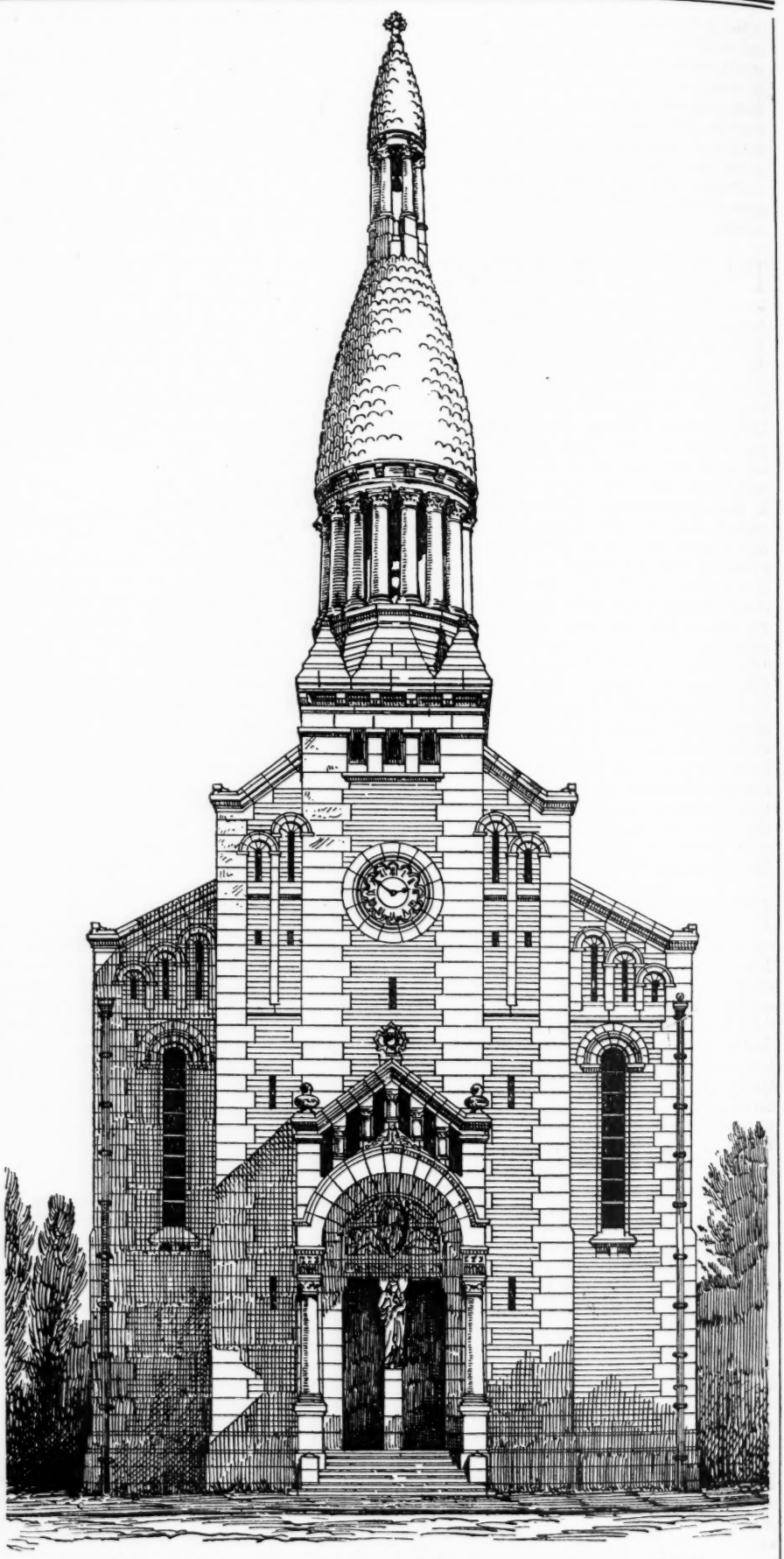
On the evening of Saturday, August 20, the party of archæologists left Plouharnel Station for the quaint old town of Quimper, when they visited the cathedral, the western spires and great part of the towers of which were built from designs of M. Viollet le Duc. From thence they went on to Pont l'Abbé. This interesting little place was formerly the seat of a Carmelite monastery, of which the church remains in good preservation, as well as part of the abbey buildings. The cloisters, having got into a bad state of dilapidation, were removed a few years ago, to the great regret of all lovers of antiquities. From Pont l'Abbé the party drove to Penmarch, visiting the church on the way. The projecting headland is singularly like St. David's Head, in Pembrokeshire.

On their return the excursionists were most hospitably entertained by M. du Chatellier, at his château of Kernuz, when he showed them his splendid museum, brought together by himself and his father, the richest collection in the world in antiquities from the department of Finisterre. After this they returned to Pont l'Abbé, where they dispersed, having had a most enjoyable and instructive excursion, and found many kind friends in Brittany.

TWO MODERN PARIS CHURCHES.

For some years Paris has erected very few religious edifices. The stoppage in this class of building, which has given France so many remarkable and noble architectural monuments, may be ascribed to two causes: the large number of existing churches, which are sufficient for present requirements, and the special bent of the administration, since 1879, in the direction of civil architecture. Accordingly, with the exception of the American Church not long since inaugurated,—and which is of course not a national building, being erected by the American community for themselves,— no new church has been erected in Paris since that of Notre Dame at Auteuil, which dates from 1880.

This church was the work of one of the most eminent members of the Académie des Beaux Arts, M. Emile Vaudremer, who also designed the church of St. Pierre at Montrouge, of the interior of which a lithograph illustration will be found on another page. These two churches, both based on the basilica form, represent therefore the most recent church architecture of Paris.



Church of Notre Dame, Auteuil, near Paris.—M. Emile Vaudremer, Architect.

The church of Montrouge is the oldest, having been commenced in the last years of the Empire; the building was interrupted by the siege and the Commune, and was finally completed about twelve years ago. It stands at the acute angle formed by the Avenue d'Orléans where it intersects the Avenue de Maine. The plan of the site, narrow at the entrance façade, and very wide at the apsidal end, constituted a special difficulty in dealing with the design, which the architect endeavoured to surmount by building a large square porch in advance of the nave, and giving great lateral extension to the transepts. The choir is arranged so as to allow of the side aisles being continued round it. In the centre is a ciborium decorated at the four angles with figures of angels, executed by M. Maniglier, and carried on polished marble columns. Above the entrance-porch is a clock-tower and campanile, about 190 ft. in height. The nave has a round-arched arcade of eight bays, on granite columns. Under the church is a large crypt, used as a religious school.

The total external length of the building, inclusive of porch and apse, is about 230 ft., and

the interior height of the nave is about 65 ft. The choir, however, is raised to a height of about 90 ft. The tower, the lower portions of the façades, and the cornices, window jambs, string courses, capitals of the nave, &c., are in hard ashlar, the remainder in hammer-dressed work; the roofs are tiled. The timber construction is all shown internally. The furniture and fittings are in waxed oak.

The painted decoration is entirely in low tones; the main portion of it consists of some mural paintings in the cupolas of the transepts, shaded in monochrome. In the tympanum of the porch is a painting on porcelain, and a statue of St. Peter, by M. Maniglier; a fine group in marble, by M. L. Durocher; and various bas-reliefs of considerable merit. The windows, which are numerous and mostly treated in *grisaille*, are the design of an able pupil of Delacroix, M. Oudinot, who has executed many important commissions for the Government. The total cost of the building was about 1,900,000 francs, or 892 francs per square mètre.

The Church of Notre Dame d'Auteuil is not yet completely finished, and has cost up to the present moment about 1,100,000 francs. Here again M. Vaudremer had to contend with a difficult site, very narrow at the façade and with a rapid fall towards the Seine. The general style of the building is somewhat based on the Romanesque architecture of the South of France. The plan takes the form of an elongated rectangle, with transepts, and terminating in a polygonal apse. The entrance façade, of which we give a view, is surmounted by a turret of very original design, rather more than 160 ft. in height. The total length of the church is a little over 200 ft.; the nave and transepts 60 ft. in height, the choir rising to nearly 90 ft. The declivity of the ground has rendered it possible to secure a crypt about 16 ft. high below part of the floor. The nave is divided into six bays of round arches, carried on stone columns, and the foundations are of concrete. The building generally, like that of Montrouge, is in rubbed stone for the tower, plinth, strings, and dressings, and of hammer-dressed stone for the filling.

In regard to decoration, up to this time the building is poor enough. In the crypt the visitor may remark a monumental bas-relief in marble, the work of Debay, and which came from the preceding church, as well as a "Mater Dolorosa" by Carpeaux, whose somewhat Pagan type of genius did not, however, lend itself very well to the representation of religious figures and feelings. In the transepts are some bas-reliefs in bronze, gilt, the gifts of some of the congregation. The figure of the Virgin and Child in the interior of the entrance porch is the work of M. Maniglier. The windows are filled with some good glass with figure subjects, executed by MM. Roussel, of Beauvais and Avenet, after cartoons by M. Theodore Maillot.

It should be added that, from want of sufficient funds the dome, which, according to the original design should have surmounted the crossing, has not yet been carried out. This, when executed, is to be composed of brick with stone bands, and lighted by circular-headed windows. It will rest on a polygonal surbase with pyramids at the angles, and will be surmounted by a cone-shaped lantern.

The former *curé* of Auteuil, the Abbé Lamazon, who was appointed Bishop of Limoges and is since dead, contributed largely to the building of this church, in support of which he gave altogether no less than 400,000 francs.

THE LIVERPOOL AUTUMN EXHIBITION.

THE seventeenth Exhibition of Pictures by Modern Artists, at the Walker Art Gallery, Liverpool, was opened on Monday, the 5th inst.

It contains in all 1,279 works of art, including oils, water-colours, architectural drawings, and sculpture.

There are, of course, on the walls several pictures from the late Exhibition of the Royal Academy, some of which have already been noticed in the *Builder*. Among them we find "The Christ Bearer," by Mr. W. F. Yeames; "Samson," the large and ugly picture by Mr. S. J. Solomon (which has been purchased by Mr. J. Harrison, of Liverpool, and presented to the Corporation for the permanent gallery: a very doubtful gift); "Carnation, Lily, Lily, Rose," by Mr. J. A. Sargent; "Whittington's Banquet," by the late D. W. Wynfield; "First Boats away after a Gale," by Mr. H. Moore; Portrait of Baron de Worms, M.P., by Mr. F. Holl; "Robert Burns, November, 1785," by Mr. J. Hodgson; "Kyle Akin," by Mr. J. Brett; "The Love Feast," and "Callista, the Image-maker," by Mr. E. Long; "Dominicans in Feathers," and "The Old Tortoise," by Mr. H. S. Marks; and Mr. Ernest Normand's "Jealousy is cruel as the grave." This is a fair contribution for a provincial exhibition to have secured, and the best of the pictures above enumerated form, especially as to figure-subjects, the cream of the collection.

In going through the rooms of the gallery we also meet with a great number of works now seen for the first time by the public, well worthy attention,—and as a whole the collection is one of great and varied interest, and probably above the average. Among the previously exhibited pictures are also Mr. Hacker's "Pelagia and Philammon" from "Hypatia" (242), and Mr. Collier's "Lilith" (315), both of which will be remembered in the Grosvenor Gallery of this season.

"The White Lady of Nuremberg" (962), by Mr. Wyke Bayliss, an interior of a Gothic church with a shrine, is a fine picture. The effect of the stained glass, however, though rich in colour, is rather deficient in transparency, and the lights and shadows are somewhat scattered. The florid Gothic work is well given. "The Schoolboard at Home," by Mr. Faed, is one of his interiors with a female figure and children, the former of whom strongly reminds us of the very pleasing one exhibited at Liverpool last year under the title of "When the Bairns are in Bed," and which was bought by the Corporation, though the present figure is scarcely equal to its predecessor. "Helpless," by Mr. T. C. Gotch, and Mr. Ayerst Ingram (128), is a shipwreck on an immense scale, but the amount of subject is scarcely proportionate to the canvas it covers. The whole scene is a sort of study in light greys, and deficient in contrast of light and shadow. The wreck is well put in, as are also the foreground figures. No. 8, "A Penzance Trawler off the Cornish Coast," by Mr. John Frazer, is very pure in tone, and full of atmosphere. If it has a fault, it is that parts of the water in the foreground, though good in form and motion, are a little hard. Mr. C. Napier Hemy has two pictures, "The Trawler's Punt," a characteristic bit, the boat stem on, well drawn, and his usual green transparent water. "On the Harbour Bar," his second work, a water-colour, is not so successful, especially in the treatment of the sea, which is rather opaque, and the general execution of the drawing not equal to this artist's oils. Mr. E. Green's picture, "Sunrise at Jerusalem" (583), looking over the Pool of Hezekiah, is fine in effect, and the architectural character of the buildings of the ancient city is well portrayed.

There are several very good works, both in oil and water-colour, having picturesque portions of street architecture for their subject. Among these may be specially mentioned "Summer-time in a Cornish Village" (536), by Mr. John McDougal. This drawing, a water-colour, is wonderfully bright and pure in its lights, and equally true and cool in its shadows, preserving the details of the buildings, while satisfying the eye as an effective work of art. In the same line follows Mr. Hampson Brown in his "Bidston Village" (435), which, while it is a faithful transcript of the village scene, is a contrast to the former in being somewhat realistic and lacking its sunny and atmospheric effect. In "The Caryatides" (315), by Mr. H. Holiday, we have an architectural subject well drawn. It is a moonlight effect. Exception might be taken to the greenish tone of the picture, but there is a fine feeling throughout it.

The strictly architectural drawings are, as before, accommodated in what the printed catalogue calls "The Vestibule," but which is, in fact, simply the staircase, where any one trying to study them is constantly interrupted by the passing and repassing of visitors to the rooms of the gallery.

Among a number of designs of local interest are those of Messrs. Lewis Hornblower & Son for the "Proposed Rebuilding of Rufford Hall," a good specimen of English Domestic architecture; and a "Design for Buildings in Victoria-street, Liverpool," by Mr. H. Summer (1,197), is an example of the modern street architecture which is fast effacing the former aspect of plain old Liverpool, as it was familiar to the resident of twenty or thirty years ago.

There are also a great number of other designs, many of them by Liverpool architects, apparently well adapted to their purposes, and many of them possessing considerable merit and originality of design.

"Graythwaite Hall, Windermere," for Lieut.-Col. Sandys, M.P., is an effective design for a large mansion in the Elizabethan style by Mr. R. Knill Freeman. It was noticed in the course of our remarks on the Royal Academy architectectural exhibits of this year, among which it had a place.

"Church for Rogerstone, Mon.," Mr. Thomas M. Lockwood. This was also noticed in our review of the Royal Academy drawings.

"Stokesay Castle," Mr. James H. Cook. An exceedingly well-executed sepia drawing from a set which obtained the R.I.B.A. Silver Medal, showing a picturesque bit of black-and-white timber work mounted on the foundations and remains of the walls of the old castle.

"Lewis's New Premises, Ranelagh-street, Liverpool," Mr. Walter W. Thomas, architect, to replace those recently destroyed by fire. This is a design in white and red brick with tall clock-tower fronting the street, and working into the design the tower in the rear still standing. The lower story is an uninterrupted row of plate-glass windows, upon which the whole lofty superstructure appears to stand,—too common a feature in modern shop architecture.

"Wesleyan Chapel and Schools, Durham-road, Gateshead," by Messrs. C. O. Ellison & Sons. This is a Geometric Decorated design with high-pitched roof and tower and spire; the adjacent schools being kept in harmony with the principal building. The same architects also exhibit design for "Wesleyan Chapel, Palmgrove, Oxton," much in the same style as the foregoing, with bell-turret only.

"New English Presbyterian Chapel, Llandudno," Mr. T. G. Williams, architect, is an Early English design with some features of Geometric Decorated. It has a small tower and spirelet.

Messrs. Bare and Beckwith send a series of designs for "Villas at Spital, Cheshire." These are of the cottage ornée type, with some black-and-white work introduced with good effect.

"The Hall and Billiard Rooms, Runnymede, West Derby," Messrs. F. & G. Holme, are two drawings in sepia of elaborately-decorated rooms of Classical character with richly-carved woodwork and panelled ceilings, well proportioned and good in detail.

"Testcombe, Fullerton," Mr. W. D. Caröe, is a picturesque design in English domestic Gothic with some black-and-white work introduced. It is an effective composition.

"Design for Commemorative Schools and Clock-tower," Mr. Edward Hodkinson. This was in the Royal Academy exhibition of this year, and was noticed in the course of our remarks on that collection.

"New Offices, Temple-court, Liverpool," by Mr. G. E. Carroll, is a good design for commercial buildings, in red brick with carved stone doorway and window dressings.

"Smoking-room, Portland-place, London," Mr. W. D. Caröe. An effective interior, Elizabethan in character, panelled in wood.

"Design for a House in Aigburth Drive, Sefton Park, Liverpool," by Mr. James W. Crofts; and "House to be erected" in the same park, by Messrs. F. & G. Holme, are both of good design, in the mixed style so much adopted in our modern dwelling-house architecture, and seem well adapted to their sites.

"Design for Town-hall, Grantham," and "Design for Memorial Clock-Tower, Pier-head," both by Mr. E. Winter. The former is a Classical design in stone, relieved by marble columns at the upper story windows and doorway, and surmounted by a small clock-tower. The latter is a Gothic design, the clock turret being supported on four open arches, but it does not possess any very original features.

"A Small Country House," Mr. Ernest H. Jones, is a pleasing specimen of Domestic Gothic, with black and white timber-work introduced.

The sculpture is not an extensive collection. It includes model bust of Philip James Bailey, author of "Festus" (life study in plaster for proposed statue), by Mr. J. A. P. Macbride; "Puck" (plaster statuette), by Mr. Hargreaves Bond; "A Child of the Lagoons," a bronze, by Mr. S. M. Fox.

IMPROVEMENTS IN THE MANUFACTURE OF PORTLAND CEMEMT.*

So much has been said and written on and in relation to Portland cement, that further communications upon the subject may appear to many of the present company to be superfluous. But is this really so? The author thinks not, and he hopes by the following communication to place before this meeting some facts which have up to the present time, or until within a very recent date, been practically disregarded or overlooked in the production of this valuable material, so essential in carrying out the important works of the present day, whether of docks and harbours, our coast defences, or our more numerous operations on land, including the construction of our railways, tunnels, and bridges, aqueducts, viaducts, foundations, &c.

The author does not propose to occupy the time of this meeting by referring to the origin or the circumstances attendant upon the early history of this material, the manufacture of which has now assumed such gigantic proportions,—these matters have already been fully dealt with by other more competent authorities; but rather to direct the attention of those interested therein to certain modifications, which he considers improvements, by means of which a large proportion of capital unnecessarily involved in its manufacture may be set free in the future, the method of manufacture simplified, the cost of manipulation reduced, and stronger and more uniformly reliable cement be placed within the reach of those upon whom devolves the duty and responsibility of constructing works of a substantial and permanent character; but in order to do this it will be necessary to allude to certain palpable errors and defects which, in the author's opinion, are perpetuated, and are in general practice at the present day.

Portland cement is, as is well known, composed of a mixture of chalk, or other carbonate of lime, and clay,—such as is obtained on the banks of the Thames or the Medway,—intimately mixed and then subjected to heat in a kiln, producing incipient fusion, thereby forming a chemical combination of lime with silica and alumina, or practically of lime with dehydrated clay.

In order to effect this, the usual method is to place the mechanically-mixed chalk and clay (technically called slurry), in lumps varying in size, say, from 4 to 10 lb., in kilns with alternate layers of coke, and raise the mass to a glowing heat sufficient to effect the required combination, in the form of very hard clinker. These kilns differ in capacity, but perhaps a fair average size would be capable of producing about 30 tons of clinker, requiring for the operation, say, from 60 to 70 tons of the dried slurry, with from 12 to 15 tons of coke or other fuel.

The kiln, after being thus loaded, is lighted by means of wood and shavings at the base, and, as a matter of course, the lumps of slurry at the lower part of the kiln are burnt first, but the moisture and sulphurous gases liberated by the heat are condensed by the cooler layers above, and remain until the heat from combustion, gradually ascending, raises the temperature to a sufficient degree to drive them further upwards, until at length they escape at the top of the kiln. The time occupied in loading, burning, and drawing a kiln of 30 tons of clinker averages about seven days.

It will be readily understood that the outside of the clinker so produced must have been subjected to a much greater amount of heat than was necessary, before the centre of such clinker could have received sufficient to have produced the incipient fusion necessary to effect the chemical combination of its ingredients; and the result is not only a considerable waste of heat, but, the clinker is not uniformly burnt; a portion of the outer part has to be discarded as over-burnt and useless, whilst the inner part is insufficiently burnt, and has to be re-burned afterwards.

Moreover, the clinker, which is of excessively hard character, has to be reduced, by means of a crusher, to particles sufficiently small to be admitted by the millstones, where it is ground into a fine powder, to become the Portland cement of commerce.

This process of manufacture is almost identical in principle and in practice with that described and patented by Mr. Joseph Aspden in the year 1824, and though various methods have been adopted for improving the quality of the cement and for utilising the waste heat by drying the slurry previous to calcination, still the main feature of burning the material in mass in large and expensive kilns remained the same, and is continued in practice to the present day.

The attention of the author was directed to this subject some time since in consequence of the failure of a structure in which Portland cement formed an essential element, and he had not proceeded far in his investigation of the cause of the failure when he was struck with what appeared to him to be the unscientific method adopted in its manufacture, and the uncertain results that must necessarily accrue therefrom.

Admitting, in the first place, that the materials employed were considered the best and most economical for the purpose readily accessible,—viz., chalk and an alluvial deposit found in abundance on the banks of the Thames and the Medway,—and being intimately mixed together in suitable proportions, was it necessary, in order to effect the chemical combination of the ingredients at an intense heat, to employ such massive and expensive structures of masonry, occupying such an enormous space of valuable ground, with tall chimney-stacks for the purpose of discharging the objectionable gases, &c., at a great height in order to reduce the nuisance to the surrounding neighbourhood?

Again, was it possible to effect the perfect calcination of the interior of the lumps alluded to without bestowing upon the outer portions a greater heat than was necessary for the purpose, causing a wasteful expenditure both of time and fuel? And, further, as cement is required to be used in the state of powder, could not the mixture of the raw materials be calcined in that state, thereby avoiding the production of such a hard clinker, which has afterwards to be broken up and reduced to a fine powder by grinding in an ordinary mill?

The foregoing are some of the defects which the author applied himself to remove, and he now desires to draw attention to the way in which the object has been attained by the substitution of a revolving furnace for the massive cement-kilns now in general use, and by the application of gaseous products to effect calcination, in the place of coke or other solid fuel. The revolving furnace consists of a cylindrical casing of steel or boiler plate supported upon steel rollers (and rotated by means of a worm and wheel, driven by a pulley upon the shaft carrying the worm) lined with good refractory fire-brick, so arranged that certain courses are set so as to form three or more radial projecting fins or ledges. The cylindrical casing is provided with two circular rails or pathways, turned perfectly true, to revolve upon the steel rollers, mounted on suitable brickwork, with regenerative flues, by passing through which the gas and air severally become heated, before they meet in the combustion-chamber, at the mouth of the revolving furnace; the gas may be supplied from slack coal or other hydrocarbon burned in any suitable gas producer (such, for instance, as those for which patents have been obtained by Messrs. Brook & Wilson, of Middlesbrough, or by Mr. Thwaite, of Liverpool), which producer may be placed in any convenient situation.

The cement mixture or slurry,—instead of being burned in lumps,—is passed between rollers or any suitable mill, when it readily falls into coarse, dry powder, which powder is thence conveyed by an elevator and fed into the revolving furnace by means of a hopper and pipe, which, being set at an angle with the horizon, as it turns, gradually conveys the cement material in a tortuous path towards the lower and hotter end, where it is discharged properly calcined.

The material having been fed into the upper end of the cylinder falls through the flame to the lower side to it; the cylinder being in motion lifts it on its advancing side, where it rests against one of its projecting fins or ledges, until it has reached such an angle that it shoots off in a shower through the flame and falls once more on the lower side; this again causes it to travel in a similar path, and every rotation of the cylinder produces a like effect, so that by the time it arrives at the lower and hotter end it has pursued a roughly helical path, during which it has been constantly lifted and shot through the flame, occupying about half an hour in its transit.

To some who have been accustomed to the more tedious process of kiln-burning, the time thus occupied may appear insufficient to effect the combinations necessary to produce the required result; but it will be seen that the conditions here attained are, in fact, those best suited to carry out effectively the chemical changes necessary for the production of cement. The raw material being in powder offers every facility for the speedy liberation of water and carbonic acid, the operation being greatly hastened by the velocity of the furnace gases through which the particles pass.

That such is practically the case is shown by the following analysis of cement so burnt in the revolving furnace or cylinder:—

Carbonic acid, anhydrous	0·40
Sulphuric acid, anhydrous	0·26
Silica soluble	24·68
Silica insoluble	0·60
Alumina and oxide of iron	10·56
Lime	61·48
Magnesia, water, and alkalies	2·02
	100·00

Again, fineness of the particles results in their being speedily heated to a uniform temperature, so that they do not serve as nuclei for the condensation of the moisture existing in the furnace gas. The calcined material, on reaching the lower end of the furnace, is discharged on to the floor, or on to a suitable "conveyor," and removed to a convenient locality for cooling and subsequent grinding or finishing.

It, however, is not in the condition of hard, heavy clinkers such as are produced in the ordinary cement-kiln, which require special machinery for breaking up into smaller pieces before being admitted between the millstones for the final purpose of grinding; nor does it consist of an overburnt exterior and an underburnt "core" or centre portion; but it issues from the cylindrical furnace in a condition resembling in appearance coarse gunpowder, with occasional agglutinations of small friable particles, readily reduced to fine powder in an ordinary mill, requiring but small power to work, and producing but little wear and tear upon the millstones.

The operation is continuous. The revolver or furnace, once started, works on night and day, receiving the adjusted quantity of powdered material at the upper or feed end, and delivering its equivalent in properly-burnt cement at the opposite end, thus effecting a great saving of time and preventing the enormous waste of heat and serious injury to the brickwork, &c., incidental to the cooling down, withdrawing the charge, and re-loading the ordinary kiln.

Cement, when taken from the furnace, weighed 110 lb. per bushel. Cement, when ground, leaving 10 per cent. on sieve with 2,500 holes to the inch, weighed 121 lb. per bushel, and when cold 118 lb. per bushel.

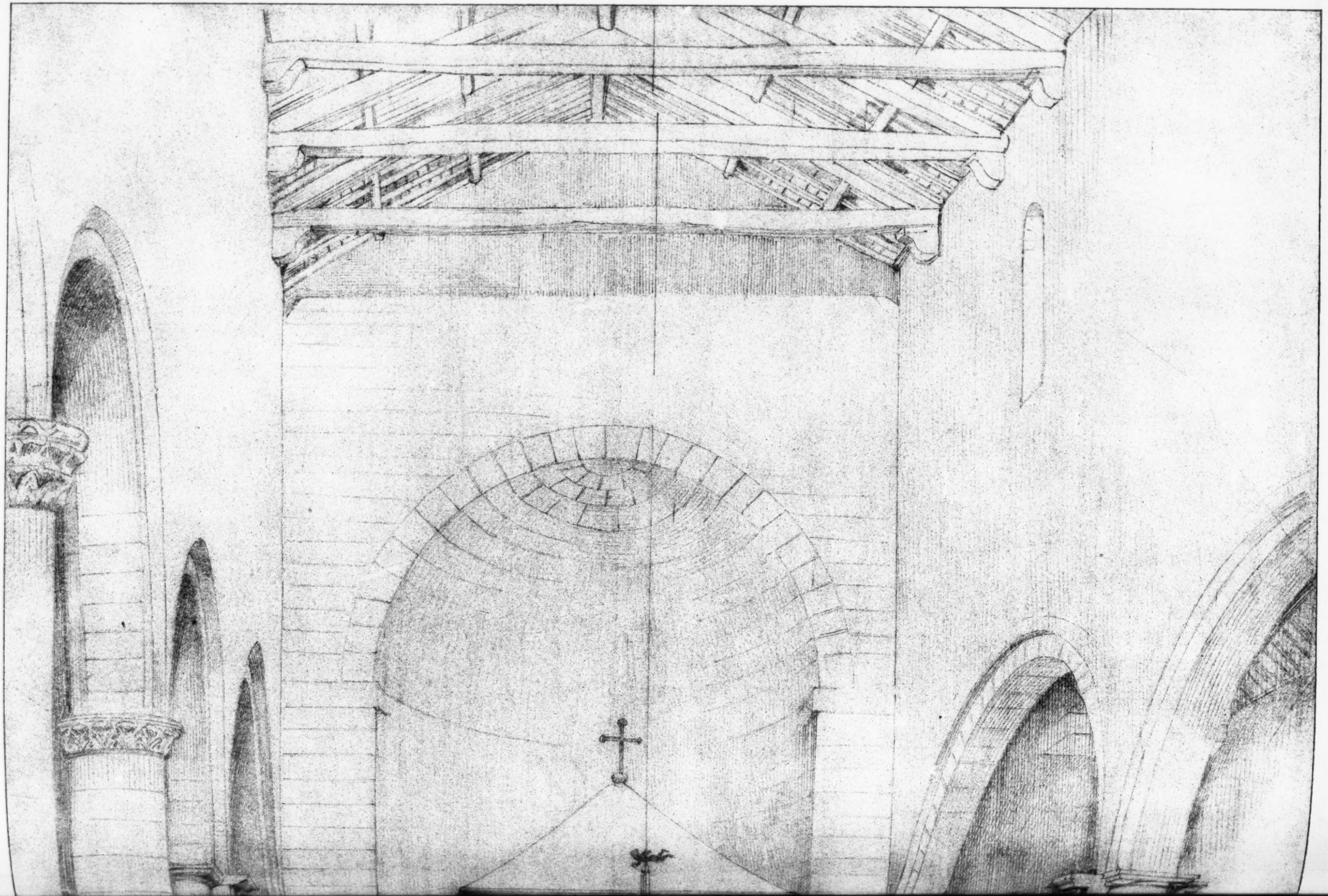
When made into briquettes the tensile breaking strain upon the square inch—

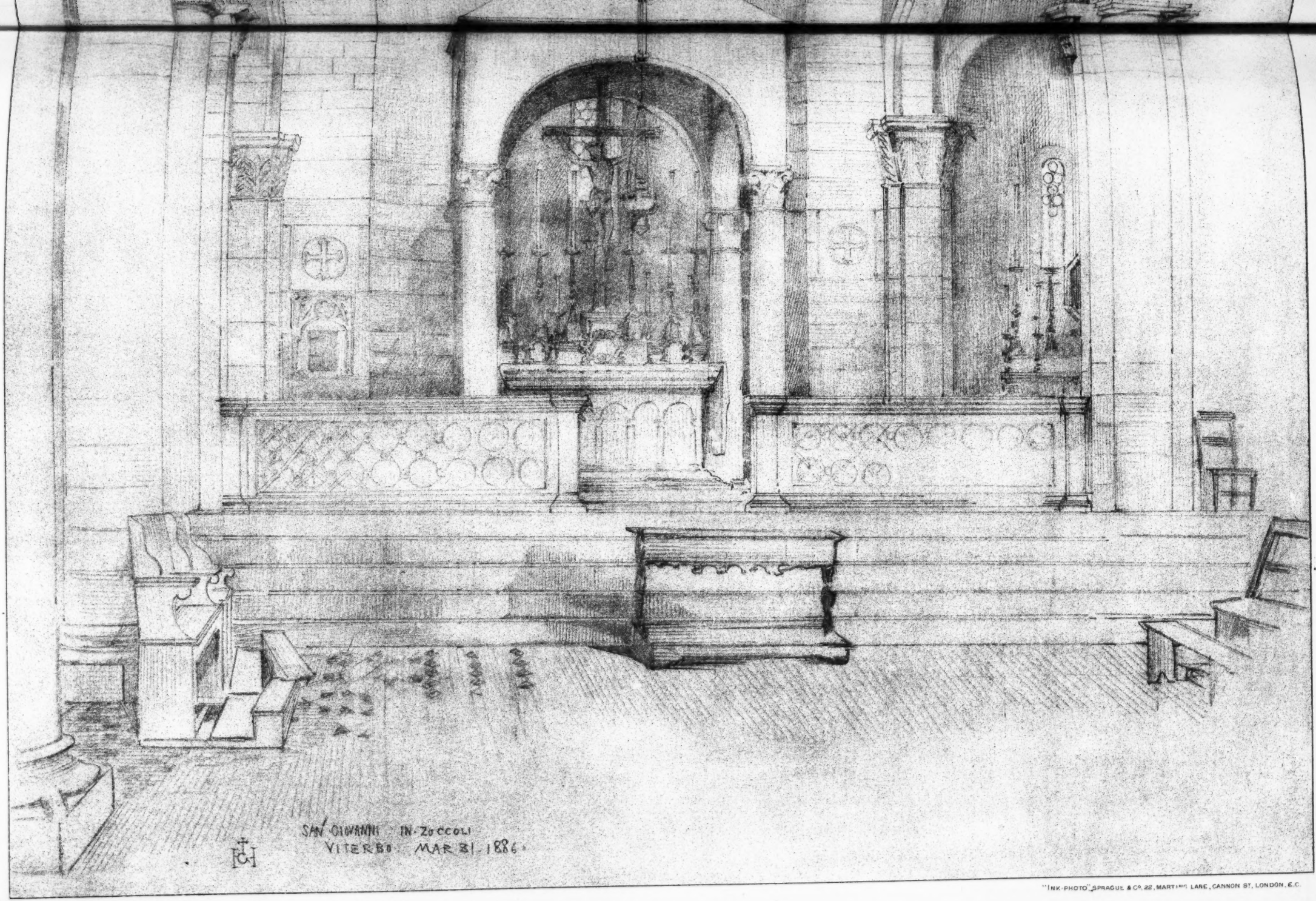
At 4 days was	.....	410 lb.	per square inch.
At 6 days	,, ...	610 lb.	,, ,,
At 14 days	,, ...	810 lb.	,, ,,
At 49 days	,, ...	900 lb.	,, ,,
At 76 days	,, ...	1040 lb.	,, ,,

A cylindrical furnace, such as the author has described, is capable of turning out at least 20 tons of good cement per day of twenty-four hours, with a consumption of about 3 tons of slack coal. It will be readily understood that these furnaces can be worked more economically in pairs than singly, as they can be so arranged that one producer may furnish a sufficient quantity of gas for the supply of two cylinders, and the same labour will suffice; but in order to provide for possible contingencies the author advises that a spare gas-producer and an extra furnace should be in readiness, so that by a simple arrangement of valves, &c., two cylinders may always be in operation whilst from any cause one may be undergoing temporary repairs, and by this means any diminution in the output may be avoided.

The advantages accruing from the employment of gas-producers for such a purpose have been abundantly proved in steel and glass-making industries, where a saving of from fifty to seventy per cent. of the fuel formerly employed has been effected. The cost is small, they occupy little room, they can be placed at any reasonable distance from the place where the gas is to be consumed, any labourer can shovel the slack into them, and they do not require skilled supervision.

* A paper read before the Mechanical Science Section of the British Association of Manchester, by Mr. Frederick Ransome, A.I.C.E

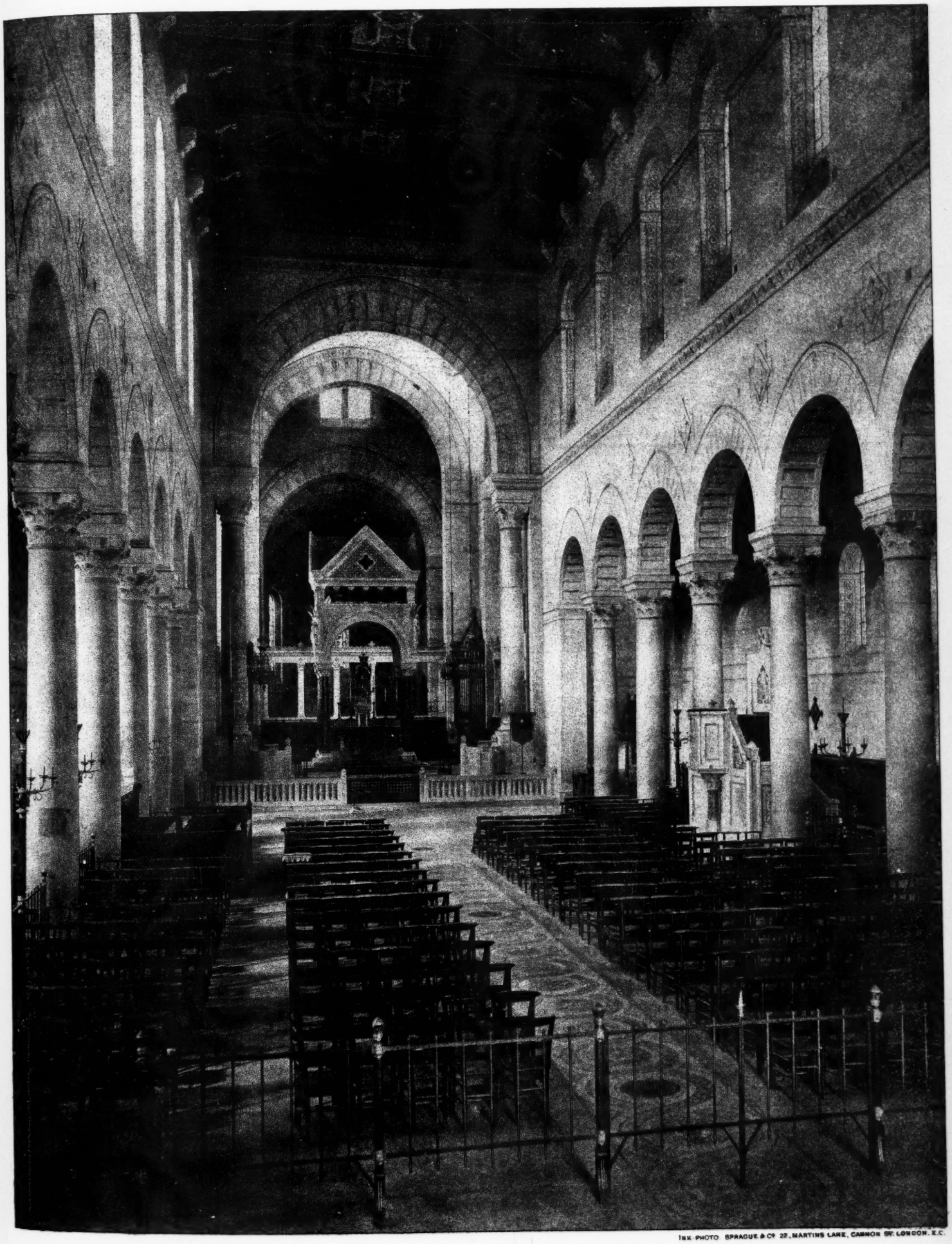




INTERIOR OF SAN GIOVANNI IN ZOCCOLI, VITERBO.—From a Drawing by Mr. Gerald Horsley.

INK-PHOTO. SPRAGUE & Cº 22, MARTINS LANE, CANNON Sᵀ. LONDON. E.C.

STATUE OF HANDEL; FOR THE PARIS OPERA HOUSE.—M. J. JULES SALMSON, SCULPTOR.



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CHURCH OF ST. PIERRE DE MONTROUGE, PARIS.—M. EMILE VAUDREMER, ARCHITECT.

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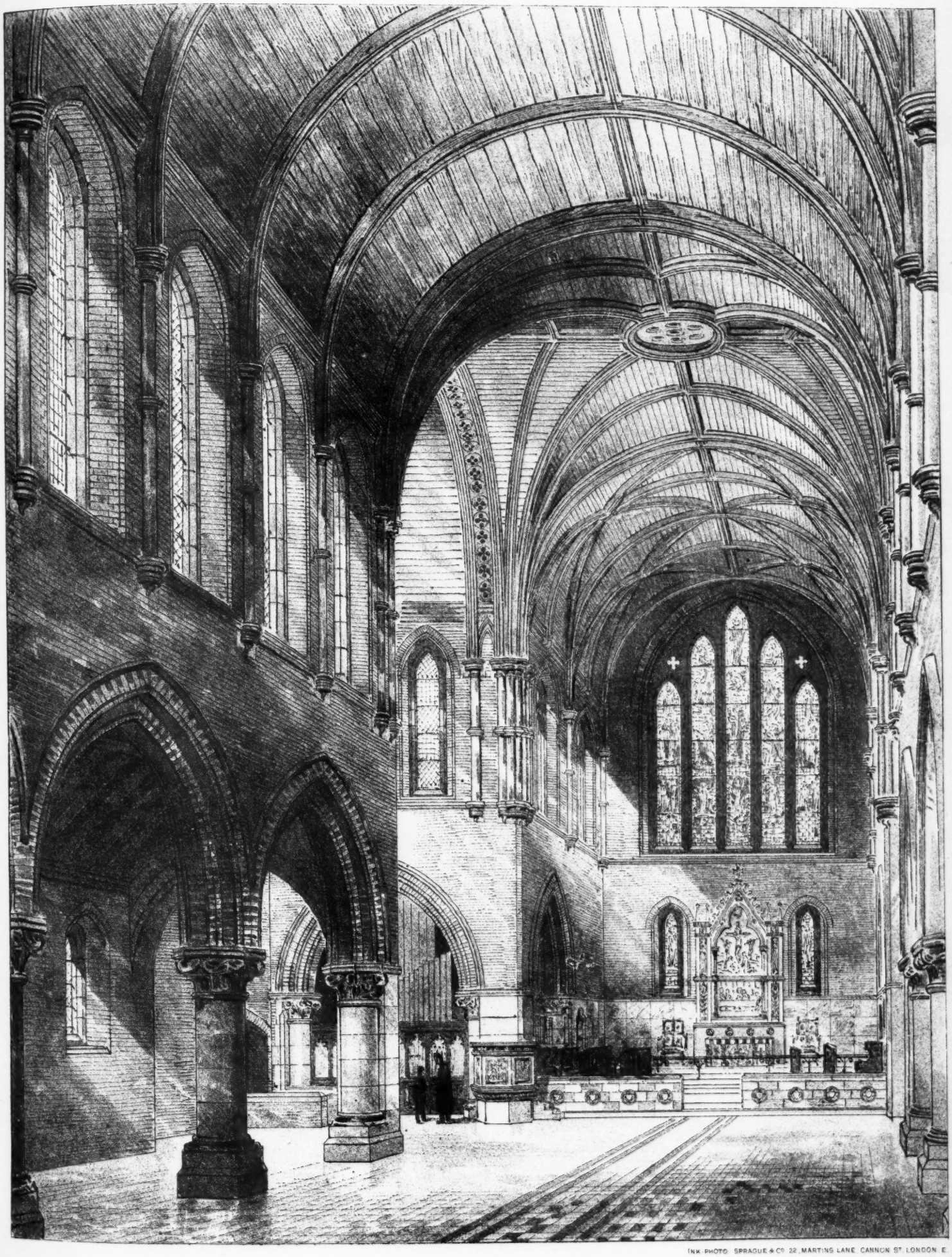
CHURCH OF St. PHILIP, BUCKINGHAM PALACE ROAD.—Messrs. Demaine and Brierley, Architects.



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CHURCH OF ST. PHILIP, BUCKINGHAM PALACE ROAD.—MESSRS. DEMAINE AND BRIERLEY, ARCHITECTS.

CHURCH OF ST. PHILIP, BUCKINGHAM PALACE ROAD.—MESSRS. DEMAINE AND BRIERLEY, ARCHITECTS.

SCHEME OF DECORATION FOR A DRA G

"INK PHOTO" SPRAGUE & Co. 22, MARTINS LANE, CANNON ST. LONDON, E.C.

G ROOM.—Designed by Mr. John J. Shaw.

It is claimed by the author of this paper that the following are some of the advantages derivable from the adoption of this method of manufacturing Portland cement, as compared with the more complex system:—

(1) Economy of space,—the furnaces, with their appurtenances, requiring only about one-fourth the space of what would be occupied by the ordinary kilns for producing a given quantity of finished cement.

(2) By continuous working, loss of fuel by cooling and subsequently re-heating of the kiln walls is avoided.

(3) Economy of repairs, which are of a simple and comparatively inexpensive character and of much less frequent occurrence, as no racking is occasioned by the constant rapid changes of temperature.

(4) Economy in first cost.

(5) Economy in grinding, a friable granular substance being produced instead of a hard clinker, whereby crushers are quite abolished, and the wear and tear of millstones greatly reduced.

(6) Economy of labour,—the conveyance to and the removal from the revolving furnace being conducted automatically by mechanical "elevators" and "conveyors."

(7) Improved quality of the cement, from non-mixture with fuel, ash, or other impurities, and no over-burning or under-burning of the material.

(8) Thorough control,—from the facility of increasing or diminishing the flow of crushed slurry, and of regulating the heat in the furnace as desirable.

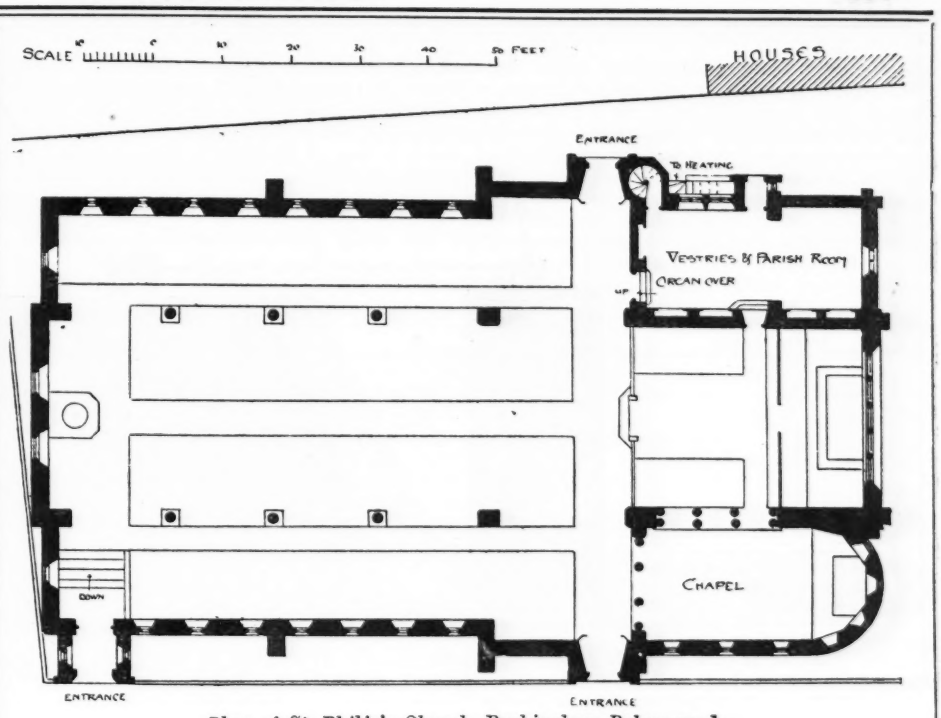
(9) Absence of smoke and deleterious gases.

It is well known that in some localities the materials from which Portland cement is made are of such a powdery character that they have to be combined, being moulded into balls or bricks previous to calcination in the ordinary way, thus entailing expense which would be entirely obviated by the adoption of the revolving furnace. This has been proved by the author, who has produced cement of a fine quality with a mixture of slag-sand from the blast furnaces of the Cleveland iron district,—prepared according to Mr. Charles Wood's process,—with a proper proportion of chalk or other carbonate of lime, which, in consequence of the friable nature of the compound, he was unable to convert in the ordinary cement-kiln, but which, when burnt in the revolving furnace, gave the most satisfactory results. The cement so made possessed extraordinary strength and hardness. It has withstood climatic influences for many years, and it has been a matter of surprise that ironmasters and others have not adopted such a means of converting a waste material,—which, at the present time entails upon its producers constant heavy outlay for its removal,—into a remunerative branch of industry, by the expenditure of a comparatively small amount of capital.

The demand for Portland cement has increased, and is still increasing, at a rapid rate. It is being manufactured upon a gigantic scale. Great interests are involved, large sums of money are expended in the erection and maintenance of expensive plant for its production, and the author submits that the development of any method which will improve the quality, and, at the same time, reduce the cost of manufacture of this valuable material, will tend to increase the prosperity of one of our great national industries, and stimulate commercial enterprise.

Works are in progress for manufacturing cement by this improved process, and the author trusts the time is not far distant when the unsightly structures which now disfigure the banks of some of our rivers will be abolished,—the present cement-kilns, like the windmills, once such a common feature of our country, will be regarded as curiosities of the past, and the manufacturers cease to be complained of as causing nuisances to their neighbours.

Hope Chapel, Wigan.—The Building Committee having advertised for designs for a new chapel, near the Market-square, received about a dozen designs from various architects. They ultimately selected, we hear, the one submitted by Mr. George Heaton, architect and civil engineer, of Wigan, as being entitled to the premium offered, viz., fifteen guineas. The cost of the building will be about 3,000*l*.



Plan of St. Philip's Church, Buckingham Palace-road.

Illustrations.

CHURCH OF SAN GIOVANNI IN ZOCCOLI, VITERBO.

THE view of the interior of this church is from a beautiful pencil sketch by Mr. Gerald Horsley,—a model of architectural sketching in pencil. As will be seen, it is a small Romanesque church of a good deal of interest and remarkable for its nearly unadorned simplicity of treatment.

STATUE OF HANDEL.

THE statue of the great composer, of which we give an illustration in this number, was exhibited in this year's *Salon*, and is intended to be placed in the vestibule leading to the grand staircase in the Paris Opera House.

The sculptor, M. Jean Jules Salmson, though his name is not much known in England, is an artist whose talent was recognised by the award of medals at the *Salon* as long ago as 1863 and 1865, and at the Great Exhibition of 1867. He is Professor of Sculpture at the École des Arts Industriels at Geneva. Among his principal works in former years may be mentioned "La Dévideuse," a bronze statue exhibited at the *Salon* of 1869 and now at the Luxembourg; "La Jugement de Paris," a polychromatic group in terra-cotta (*Salon* of 1869); "Phrynée devant l'Aréopage," a bronze (*Salon* of 1870); "Henri IV.," a plaster statue for the Hôtel de Ville of Rochelle (*Salon* of 1876). We may mention also four caryatide figures representing Comedy, Folly, Satire, and Music, which form decorations to the façade of the Vaudeville Theatre; "L'Innocence, L'Amour, et La Folie," a terra-cotta group the property of the Prince of Wales; and "The First Ascent of Mont Blanc," which was in this year's *Salon*.

In the statue of Handel, M. Salmson has very finely realised the character of the man, as known to us from the various biographical notices and records of his highly characteristic sayings and manners which are extant,—a man with a strongly-pronounced individuality, and a nature at once proud, defiant, and yet generous; and there is a sturdy power in the figure and expression which seems well in keeping also with the character of the composer's artistic productions.

ST. PHILIP'S CHURCH, BUCKINGHAM PALACE-ROAD, LONDON.

THIS church is now in course of erection for Canon Fleming, as a Mission Church to St. Michael's, Chester-square.

The Duke of Westminster gave the site, and has contributed largely to the building.

The designs have been somewhat altered since the perspectives were made. The plan we give, however, is as executed.

The materials used are Gainsborough bricks for the outside facing, and stocks inside for plastering on; the core of the walls being of cement concrete, bonded with iron. Doulting stone is used for outside work and Corsham inside. The roofs are of pitch pine and fir, covered with Broseley tiles.

The flêche (which is loftier than shown on the view) will be covered with 26-oz. copper.

The church will be seated with chairs, and will hold about 800. The cost, exclusive of furniture, will be slightly over 6,000*l*.

Messrs. Macey & Sons, Strand, are the contractors. Mr. T. W. Creed is clerk of works, and the architects are Messrs. Demaine & Brierley, of York.

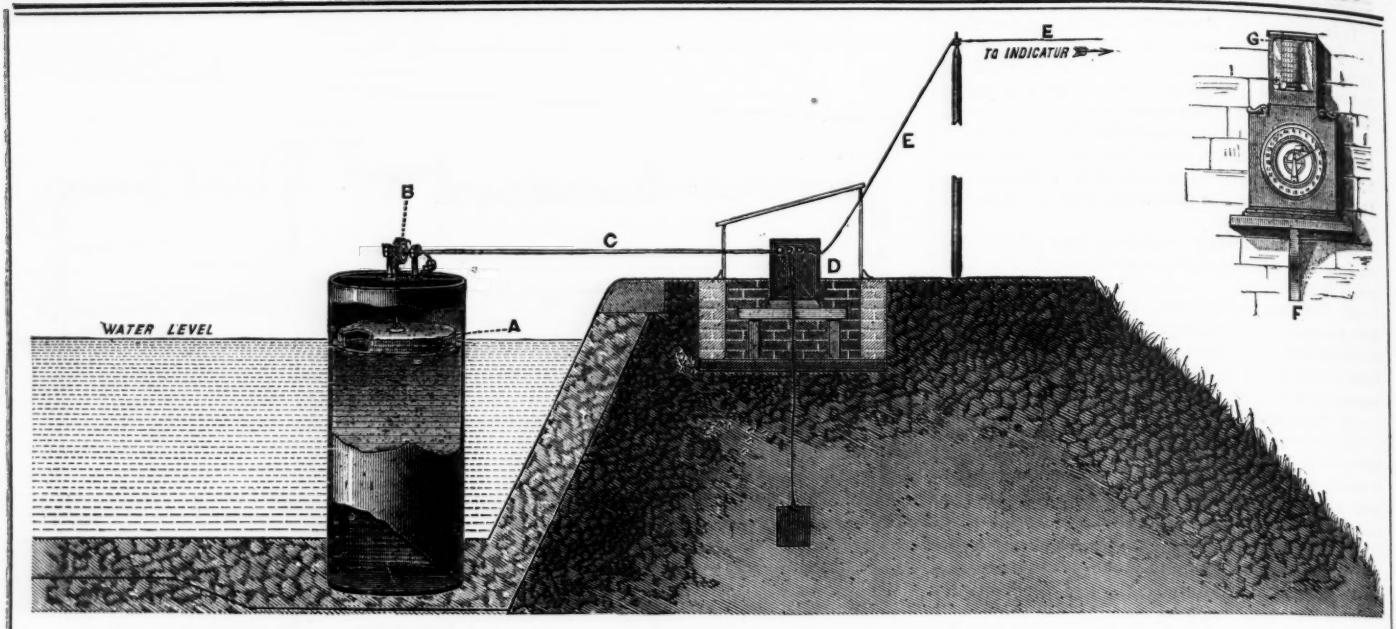
SCHEME FOR THE DECORATION OF A DRAWING-ROOM.

IN this scheme the painted frieze of peacocks is treated mainly in blues and greens on gold; it is divided into long panels by winged genii carved and gilded. The walls are hung with red figured silk in panels; the woodwork is in rosewood, with carved panels; the architraves, dado capping, and skirting are ebonised. In the centre panels of the large doors are bronze medallion heads of Poetry and Music; the smaller panels being enriched by marble plaques in the cartouches. A frieze of Cupids and seahorses over the doors is carved and bronze gilt, with a central tablet of lapis lazuli for the inscription. JOHN T. SHAW.

[The design was hung in the Architectural Room at the Royal Academy of this year.]

Proposed Registration of Edinburgh Plumbers.—A meeting of the master plumbers of Edinburgh and Leith was held on the 9th inst., there being upwards of fifty masters present. The object of the meeting was to consider the subject of the registration of plumbers, which was laid before a previous meeting by a deputation from the Worshipful Company of Plumbers, London. The meeting unanimously approved of the registration of both masters and men, and appointed a committee of thirteen to represent them at a public meeting to be held under the presidency of the Lord Provost.

The Borough Surveyorship of Doncaster. On the 8th inst. a special meeting of the Council in Committee was held, to consider the applications for the position of Borough Surveyor. The salary is 250*l*. a year. There were 154 applications, which had been reduced to ten, and these were further reduced to five, as follows, who are to meet the Council on the 20th, when the final selection will be made:—W. Spink, Dukinfield; S. G. Gamble, Grantham; W. H. R. Crabtree, Rotherham, Resident Engineer of the Rotherham Waterworks, who obtained the highest number of votes; H. C. Crummack, York; and R. J. Duff, Doncaster, Assistant Borough Surveyor.



Jennings and Brewer's Patent Electro-Mechanical Apparatus for Indicating and Registering the Levels of Liquids.—Fig. 1.

JENNINGS AND BREWER'S APPARATUS FOR INDICATING THE LEVELS OF LIQUIDS IN RESERVOIRS, SEWERS, &c.

THE object of this invention, which has been patented by the inventors and is manufactured by Mr. George Jennings, of Stangate, Lambeth, is to register correctly the fluctuations in level of water or sewage at any distance from the point of observation, as, for instance, in reservoirs some miles outside towns, or outfall sewers in low-lying portions of districts liable to flooding. In such cases the apparatus will be found of considerable use and in many instances invaluable, as it indicates truly what is taking place in the reservoir or sewer. It formed the subject of a short paper read by Mr. Walter Jennings at the recent Leicester meeting of the Association of Municipal Engineers and Surveyors. The following is a general description of the apparatus. The above illustration (fig. 1) shows the apparatus working in connexion with a reservoir in which is a cylinder and containing

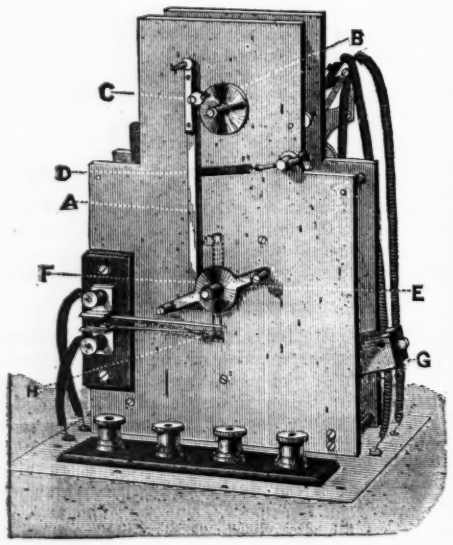


Fig. 2.

the float A. The float is connected to a chain passing over the pulley B, the dead weight of the float being counterpoised by a weight attached to the other end of the chain. The pulley B is keyed to the shaft C, which sets in motion the mechanism of the transmitter D, and at every inch or other period or difference of level (as may be arranged) of rise or fall, an electric current is transmitted along the line E to the indicator or receiver F, which may be situated at any distance from the reservoir and is usually fixed in the engine-room at the pumping station. A recording arrangement, G, can be added, so that a permanent record can be kept of the varying levels during each week on a diagram attached to the revolving drum, which contains a clockwork movement.

Fig. 2 shows the arrangement of the transmitter (marked D in fig. 1). The weight G, when raised by the movement of the float, is held in position by a clutch on the lever A catching against a pin on the double revolving arm E. The weight G is released by the lever A when thrust out by a pin on the revolving disc B striking against the adjustable cam on the lever A at C, thereby releasing the weight G and causing the double arm E to revolve one half turn, when it is again caught and retained by a similar arrangement on the obverse side of the transmitter, so that at every period of rise or fall of the liquid in the reservoir the lever A, being alternately acted upon by the disc B, first releases and subsequently holds in position the revolving arm E. The latter, in revolving, presses together the two springs H for an appreciable space of time, thus completing an electric circuit.

Fig. 3 is a kind of isometrical bird's-eye view of the back of the transmitter, showing the commutator and the spindle to which is attached the shaft on which the pulley B rotates.

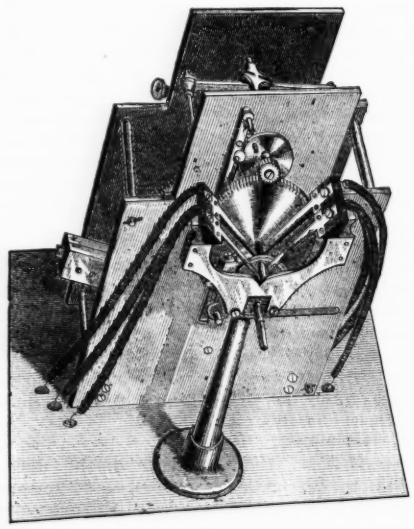


Fig. 3.

Fig. 4 shows the mechanism of the indicator or receiver when at rest.

Fig. 5 is an enlarged view of the upper part of the same mechanism when an electric current from the transmitter is received,—the rods H H having been elevated by the action of the electro-magnets, thereby lifting the levers G G, to which are pivoted the pawls one tooth higher of the wheel A; at the same time a pin at the end of the lever G draws out the opposite pawl clear of the wheel A, and the current, passing through the coils J, attracts the armature on the end of the lever E, the reverse end of which is pointed at D to fit into the notched break wheel B. Upon the current being broken the break is instantly released, and the pawl that has been raised upon falling engages a tooth and causes the wheels to revolve one section of the circumference and allows the opposite pawl to resume its former position, thus immovably fixing the escapement wheels A, which are fixed with the teeth opposite,

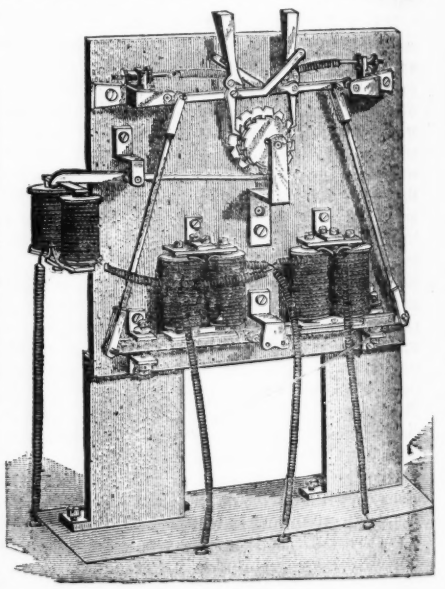


Fig. 4.

thus providing a similar action to take place when the current is reversed by the commutator.

The inventors claim that the apparatus is also applicable for denoting the direction and velocity of air-currents. Into this phase of the invention we need not here enter, but we may

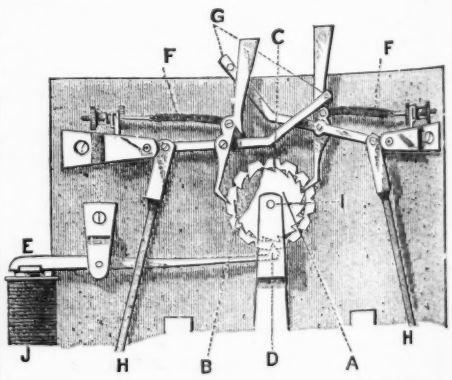


Fig. 5.

mention that when the apparatus was exhibited and described at the meeting before referred to, the general opinion of the borough surveyors and engineers then assembled was that the apparatus is likely to prove of great practical and public utility, especially in indicating the level of water in sewers.

ARCHITECTURAL ASSOCIATION

THE Architectural Association on Saturday, the 10th instant, made one of their vacation visits to Ascott, the seat of Mr. Leopold de Rothschild, situated near Leighton Buzzard, now being enlarged under the direction of Messrs. Devey & Williams, architects.

The house was formerly quite a small farm-house, and has been added to at various times. The present additions consist of a new billiard-room (the present billiard-room being converted into a dining-room), and new kitchen and offices, and large suites of servants' bedrooms and nurseries. The kitchen and sculleries are built with glazed bricks internally, with glazed brick cove to ceiling; arrangements are being made to light the whole of the building with electric light. The house still retains traces of its cottage origin in the height of the two stories, the ground-floor being 9 ft. and the upper floor 7 ft. high. The billiard-room, now the dining-room, is higher, and so also is the new billiard-room: both these rooms are panelled throughout in oak.

The external treatment is half timber and rough cast, with tile hangings; the garden frontage is very extended and picturesquely broken up by various projections.

The position of the house is very charming, having a fine view across an undulating country to the Chiltern Hills. The gardens, which have recently been enlarged, are beautifully timbered and planted.

The stables, near the house, which is arranged with two yards, have thatched roofs, and are very extensive. They contained forty horses at the time of the visit, which constitute Mr. Rothschild's hunting stud, the racehorses being at the stud-farm and at Newmarket.

The staghounds are kept in another part of the grounds, and the kennels were visited, and great interest shown in the various arrangements for feeding the hounds. The pack, which consists of thirty-two hounds, were let out into the paddock for the benefit of the members, and were much admired.

In consequence of illness in Lord Rosebery's family, the proposed visit to Mentmore had to be postponed. The house is about four miles from Ascott, and can be distinctly seen from several parts of the grounds at Ascott. Instead of visiting Mentmore, therefore, the party proceeded to Leighton-Buzzard, and examined the fine parish church. This church is cruciform on plan, with a tower and stone spire at the crossing. The spire is remarkable for its entasis and small broaching. There is a fine wooden rood-screen with curiously-carved dragons on the points of the cusps of the central arch, and bird crockets on some of the other arches. There are good stalls in the choir with return against the rood-screen.

THE WALLS OF CHESTER.

SIR,—In your issue of the 3rd inst. [p. 320] there is an article by Sir James Picton, on the question as to whether the present walls of Chester show any trace of Roman work. As there has been, and still is, a great conflict of opinion on the subject, permit me, as one of the original promoters of the non-Roman theory, to say a few words in reply to Sir James.

His article may be divided into two parts, firstly, on the portion of the walls seen by the Archæological Institute last year; and secondly, on the new excavation, near the Phœnix Tower. Sir James says that at the Kaleyards the wall "is built on the old Roman lines." This has never been denied: in fact, from the Newgate angle to the Phœnix Tower, and thence to Morgan's Mount, the wall, as I have argued, both in my "Roman Cheshire" and elsewhere, is on Roman lines. Of the wall at this point (the Kaleyards), Sir James said last year, after both Mr. Shrubsole and myself had explained to him the result of the excavations made by the late Dean Howson at its base, that "it exhibited no signs of Roman work; the characteristic wide mortar joints of Roman work were wholly absent" (*Builder*, August 21st, 1886), and this was chiefly from examination of the large stones projecting at the base and in front of which the excavations had been made. But when Mr. Brock, on the 22nd ult., remarked upon the close joints of the stones at this point, "so close that he could not insert the blade of a pen-knife in them" (*Chester Courant*, August 31st), Sir James endorsed his view and declared the wall Roman. As stated in my "Roman Cheshire," I believe the base of the wall at the Kaleyards to be of the time of Edward I., and I think Sir James will find similar close joints without mortar in *portions* of buildings of much later date.

Sir James further states that there was a "peculiarity" at the east end of the north wall: "a little above the surface the wall was double, with an interval between. This was pronounced to be Mediæval work of uncertain date." This is exactly where Roman tombstones, &c., have been found in the wall from base to summit. The tombstone of a *Præfectus Castrorum* was met with 6 ft. above the ground surface, whilst a stone bearing two figures, one an ecclesiastic, has been found at the base and in the centre of the wall. Was the latter placed in position first? If so, according to Sir James's idea, it proves that the base must have been erected in *post* Roman times, the summit *in* Roman times, an inverse chronological arrangement.

The North Gate cornice, and wall adjoining, which I have described in "Roman Cheshire," as being composed of Roman stones, brought from some large building (the interior, which Sir James has not seen, is very like the hollow wall he describes above as "Mediæval, of uncertain date"), he speaks of as being of Roman origin, with repairs and insertions of subsequent date. No one denies the existence of Roman stones in its face; but when were they placed there? We have every reason to believe, in the reign of Anne, when all this part of the wall was greatly repaired. The large stones on the Roodee are next referred to by Sir James. Last year, whilst helping him up on to the lowermost stone, he remarked to me, "This is no Roman wall." To him, and to the Institute generally, whom it had fallen to my lot to conduct round the walls, I explained the result of the excavations made in front of these stones, to the depth of 15 ft., a year or two previously, by order of the Mayor, and he expressly then stated that the stones could not be a Roman wall, but merely (as partial excavations had shown) a retainer to keep the bank from slipping. I believe, as I then and had previously stated, that the stones are Roman, taken from a large building. Sir James is perhaps not aware that at something like 100 ft. behind these stones the remains of a Roman villa lie buried, and if the stones were placed there in Roman times (which I do not for a moment think) it was to keep the ground on which the villa stood from slipping forward (as it has done in the immediate vicinity) into the estuary. They are entirely out of the line of the present walls, and the original wall of the *castrum* seems to have been far inside, to the eastward; and from the summit of the plateau on which the fortress was built the sloping ground to the Roodeye is found to be full of the remains of villas (including that named above) and private graveyards, to the very side of the estuary, sure *indicia* of the spot being extra-mural. A large number both of architects and archæologists still hold the opinion I have named with regard to these three portions of the walls, and I believe that one or two publications on the subject are forthcoming.

It was a committee of experts, appointed by the Archæological Institute, who last year examined the walls generally, and especially the points named, and their verdict delivered by the Rev. Dr. Bruce (the historian, and for forty years the incessant explorer of the Roman wall) was that "nothing they had seen was Roman work *in situ*." I am glad to see that even Sir James partially confirms this verdict, for he says in his recent article, "The walls above ground are, for the most part, post-Roman, of various age." This was the great point contended for last year, but I have stated in "Roman Cheshire" and elsewhere, over and over again, that we may expect to find traces of the Roman foundations of the walls, and this was verified in March last by the foundation of the destroyed southern wall being encountered in Bridge-street. It was 8 ft. thick, formed of boulders set in concrete, and so hard that it was with the very greatest difficulty cut through in order to lay gas-pipes. But as to the portion just laid bare on the north face, a loosely-built wall, without mortar from base to summit, of stones of various sizes, though chiefly large ones, many of them taken from Roman buildings, others tombstones, friezes, cornices, &c., it presents no feature whatever of Roman construction. I am perfectly aware that in such works as the aqueduct at Nismes, referred to by Sir James at Chester, immense square stones were employed for building without mortar; but I will ask him the further question, Did he ever know of a Roman *castrum* whose walls from base to summit were built without mortar?

Mr. Roach Smith, in reply to a letter of mine, brought forward the fact of the foundations of Richborough, Reculver, and Lymne having no mortar, but he said nothing of the superstructure. That is a solid mass of stones, concrete, &c., from base to summit.

Instead of the controversy on this subject being "set at rest," as Sir James hopes, I fear it is only just inaugurated.

W. THOMPSON WATKIN.

Liverpool, Sept. 13, 1887.

SIR,—Allow me to suggest a course by which irresistible evidence, and not assumptive evidence, could be obtained, as to the fact that the excavations of August last "have entirely invalidated" the theory of Hyginus.

His life, in the early part of the first century, was before the time of Trajan, for the eastern Prætoria at Rome was constructed on the lines of Hyginus, A.D. 23, and gives a length and breadth of 2,320 ft. by 1,620 ft. This length is found in Chester from Newgate to Phœnix Tower; the breadth thence to Morgan's Mount; the other sides, or, rather, side and end, are now existing beneath two perpendiculars erected on these known base lines on the east and north; approximately, under Nicholas-street and its continuation, and in Pepper-street and through the centre of the garden of the Probate Court in Whitefriars.

Until these existing, yet buried, foundations are disproved, I hold that the theory of Hyginus was put into practice in Chester, as the discovery of the hypocaust in Bridge-street and Feathers-lane proves the site of the valetudinarium.

Allow me to take exception to another remark in the article,—"The Via Prætoria, intersecting the city in its length, crossed by the Via Principalis." The Via Prætoria led only from the Prætorian Gate (the North Gate, near Whitefriars) up to the Via Principalis (to the site of St. Peter's Church), and did not cross that street.

With these corrections, I cordially agree with the remarks.

GEO. ESDAILE.

Stretford, Sept. 13, 1887.

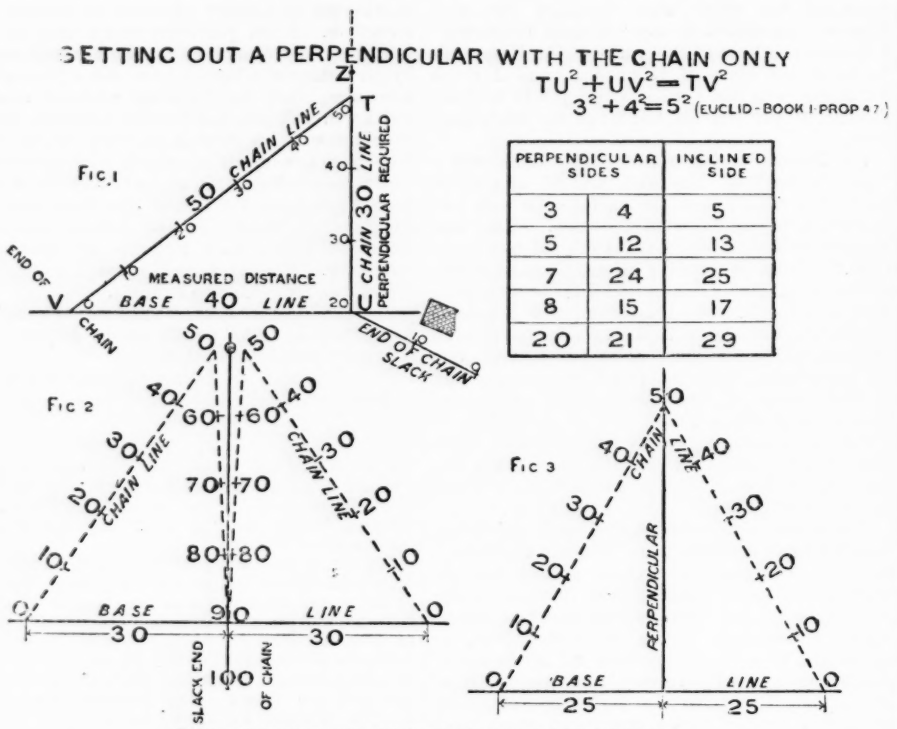
SHONE'S EJECTORS IN THE RECENT RAIN-STORMS.

SIR,—It was prophesied some time ago by certain *uncivil* engineers, who are very hostile to Shone's hydro-pneumatic system of drainage, that upon a very heavy rain-storm occurring at Westminster Shone's three ejectors, of 1,100 gallons aggregate capacity, and Atkinson's four gas-engines of four horse-power each, at the Houses of Parliament, would be overpowered and the basements there drowned. On the 17th ultimo a phenomenal and tropical rainfall occurred at Westminster, far beyond anything of the kind that has taken place in London for many years past, namely, of 0·59 in. in depth per hour, or 14·16 in. per day of twenty-four hours. As the area draining to the ejectors is 10 acres, the quantity of water draining therefrom to be ejected was 357 cubic feet, or 2,227 gallons per minute.

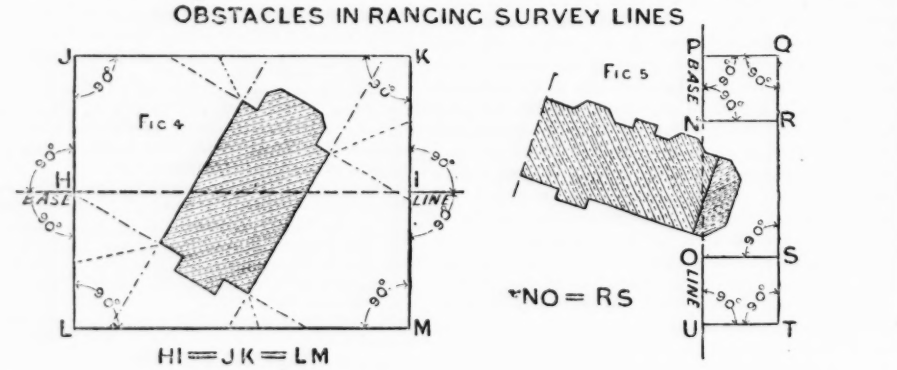
This quantity the three ejectors and the four gas-engines, all working together, successfully discharged, without any flooding whatever of the basement. It results from this fact that the ejectors received and discharged 1,113 gallons of water every half-minute during the storm. The lift was 20 ft. to the head of water in the main sewer outside, and 1,113 gallons of compressed air at 10 lb. pressure on the square inch were produced by the gas-engines and consumed by the ejectors per half-minute. I may state that for about two minutes the reserved storm water sub-way received about 2,000 gallons of water from the overflow thereto in the sewage manhole, which, however, soon drained away as the storm subsided.

I am glad to congratulate Mr. Shone on his ejectors performing their functions so admirably and so successfully. I felt assured that they would do so from what I had seen of their performance elsewhere. It was this that gave me confidence to recommend their adoption, under the peculiar circumstances, at the Houses of Parliament, in preference to ordinary pumps, whether centrifugal or otherwise.

JOHN PHILLIPS, C.E.



PERPENDICULAR SIDES		INCLINED SIDE
3	4	5
5	12	13
7	24	25
8	15	17
20	21	29



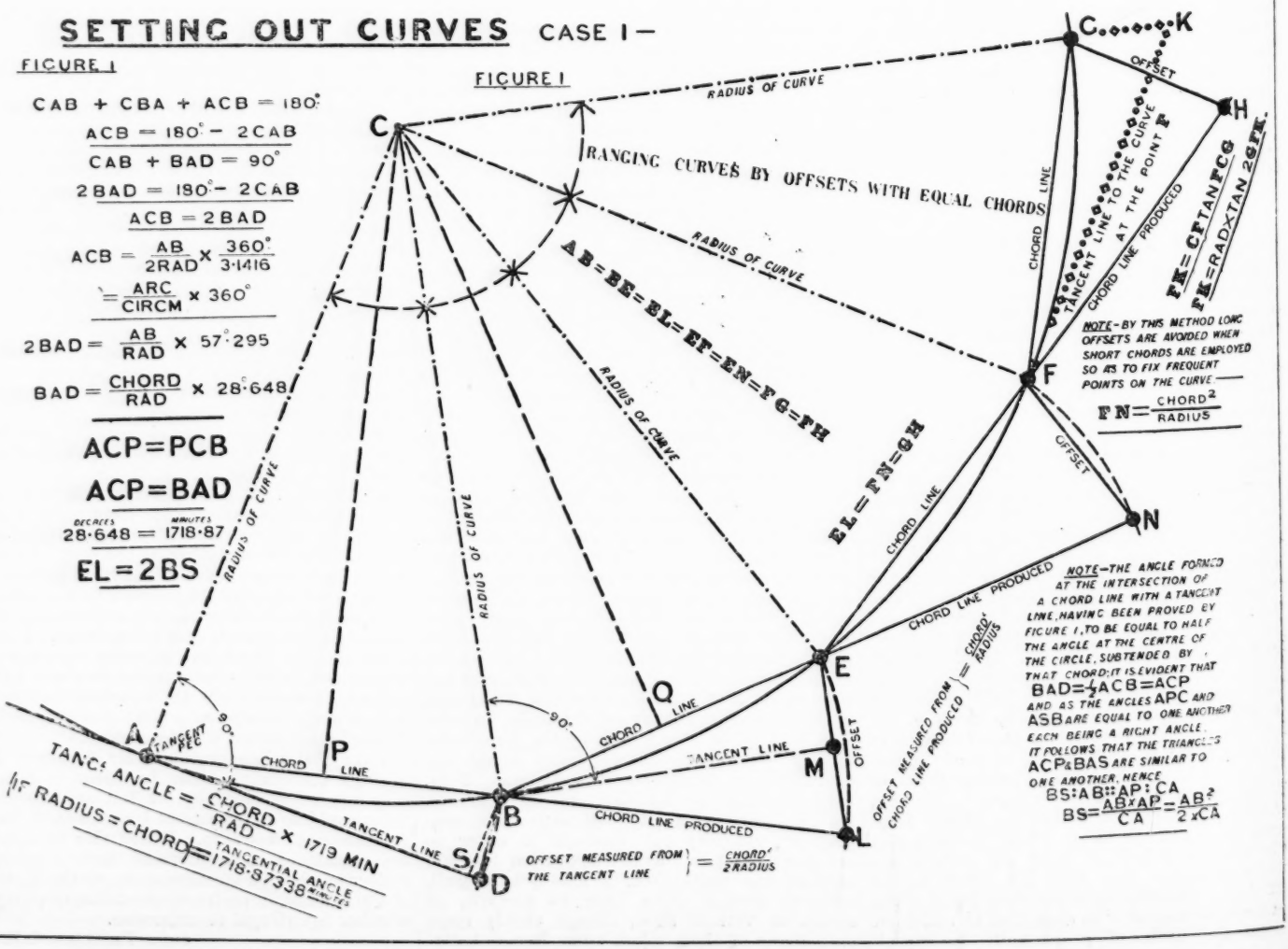
The Student's Column.

LAND SURVEYING AND LEVELLING.

XII.—SETTING OUT LINES.

Perpendiculars.—A perpendicular in a horizontal plane to a base line may be set out with the use of a chain only, in the manner shown by figures 1, 2, and 3. A right-angled triangle is formed, having its sides in the proportion of the numbers given in the accompanying table to fig. 1; but the proportion of 3, 4, and 5 is generally selected, as the points of intersection at the angles are here more clearly defined than they would be if the proportion of the other lengths were taken. A distance of 40 links is measured along the base line in fig. 1 from the point at which the direction of a right angle is required. The assistants then hold the handle of the chain at V, and the 80th tally at U, while the surveyor holds the 50th tally, and pulls up the chain at T, so as to form the sides of the triangle T U V, respectively equal to 50 and 30 links with the chain. T U is thus set out at right angles to V U. If, instead of 40 links, 30 links be measured along the base line from U to V, then the 90th tally must be held at U to obtain a similar triangle as shown in fig. 2. Should the chain be suspected to be out of order, as indicated by the dotted lines in fig. 2, the exact direction of a right angle may be obtained by setting out the triangle upon both sides of a perpendicular and bisecting the distance marked by the 50th tally upon the chain to obtain the position of the full line, shown in fig. 2, between the dotted triangles. If the 50th tally comes to the same point in both cases it shows the method to have been correctly applied and the chain to be sufficiently accurate for the purpose. In fig. 3 an equilateral triangle is formed by measuring 25 links along the base line upon each side of the point at which the right angle is required, and while the handle at each end of the chain is held by the assistants at the points so arrived at, the surveyor pulls out the chain and marks the position of the 50th tally, through which the perpendicular line would pass.

Obstacles.—Fig. 4 shows how the distance H I may be measured when a rectangle can be


SETTING OUT CURVES CASE 1—
FIGURE 1
CAB + CBA + ACB = 180°
ACB = 180° − 2CAB
CAB + BAD = 90°
2BAD = 180° − 2CAB
ACB = 2BAD
ACB = AB/2RAD × 360°/3·1416
= ARC/CIRCM × 360°
2BAD = AB/RAD × 57°·295
BAD = CHORD/RAD × 28°·648
ACP = PCB
ACP = BAD
DEGREES 28·648 = MINUTES 1718·87
EL = 2BS
FIGURE 1
RADIUS OF CURVE
RANGING CURVES BY OFFSETS WITH EQUAL CHORDS
AB = BE = EL = EF = EN = FG = FH
EL = FN = GH
CHORD LINE
TANGENT LINE TO THE CURVE AT THE POINT F
CHORD LINE PRODUCED
FK = CF TAN FCG
FK = RAD × TAN 2GFK
OFFSET
NOTE—BY THIS METHOD LONG OFFSETS ARE AVOIDED WHEN SHORT CHORDS ARE EMPLOYED SO AS TO FIX FREQUENT POINTS ON THE CURVE
FN = CHORD²/RADIUS
NOTE—THE ANGLE FORMED AT THE INTERSECTION OF A CHORD LINE WITH A TANGENT LINE, HAVING BEEN PROVED BY FIGURE 1, TO BE EQUAL TO HALF THE ANGLE AT THE CENTRE OF THE CIRCLE, SUBTENDED BY THAT CHORD; IT IS EVIDENT THAT BAD = ½ACB = ACP AND AS THE ANGLES APC AND ASB ARE EQUAL TO ONE ANOTHER EACH BEING A RIGHT ANGLE. IT FOLLOWS THAT THE TRIANGLES ACP & BAS ARE SIMILAR TO ONE ANOTHER. HENCE
BS : AB :: AP : CA
BS = AB × AP / CA = AB² / 2 × CA
TANGENT ANGLE = CHORD/RAD × 1719 MIN
IF RADIUS = CHORD / TANGENTIAL ANGLE MINUTES = 1718·87338
OFFSET MEASURED FROM THE TANGENT LINE = CHORD²/2RADIUS
OFFSET MEASURED FROM CHORD LINE PRODUCED = CHORD²/RADIUS

formed upon both sides of it, and fig. 5 shows how the distance N O may be measured when it can be passed upon one side only. With a view of proving the accuracy of the work the perpendiculars at each end are erected upon both sides of the base line in fig. 4, while in fig. 5 double perpendiculars are set out at each end upon the side of the building that admits of this method. The buildings can be surveyed by offset measurements from the sides of these rectangles. The right angles can be best set out either by the use of the optical square or cross staff. A theodolite being adjusted generally for long vision only, will not be found to be so accurate for the short distances at which the angles are here fixed.

Curves.—The angle between a tangent line and a chord being proved by the consideration of Case 1 to be equal to half the angle at the centre of the circle subtended by any given length of chord we are enabled to set out a curve as shown in the diagram (fig. 1), the length of the successive chord lines and chord lines produced being measured with a chain and the offsets with a tape. The unit angle, or angle in which the chord is equal to the radius, is seen to be 57·295 degrees at the centre of the circle, giving a tangential angle with the chord, equal to 28·648 degrees, or 1719 minutes nearly. This unit tangential angle serves as a *constant*, which enables us to set out various points in a curve independent of the determination of the centre of the circle.

ANCIENT CHAIR IN THE BODLEIAN LIBRARY.

SIR,—In regard to the chair illustrated in our issue for Sept. 3 [p. 326], called the "Fortescue," and of which it is said "it probably formed a part of the furniture of Saldon House, Mursley, Bucks, the seat of Sir John Fortescue," the internal evidence implies that the original owner must be a different person.

On the finely-carved back of the chair there are two heraldic lions rampant, supporters to what appears, by the fruit at the top, to be a fig-tree. These lions are presumably the supporters of the original owner, for whom the chair was made. Apart from any colour in the carving, these lions exactly represent the supporters of the Duke of Kingston, viz., two lions rampant *sable*,—as depicted in the "Notitia Anglicana," which is the eldest authority I have (1724): whereas the Fortescue supporters are, two greyhounds *argent*, ducally gorged *or*, with line *gules*.

ROBERT ESSERY.

Northampton, Sept. 9th, 1887.

DUTIES OF A CLERK OF WORKS.

SIR,—The letter of "Architect" in your last issue p. 378] complains of the brevity of my tract. I know there is a popular prejudice in favour of quantity, but I have endeavoured to make these few pages as concise as might be, and I have no desire to add to them at present.

The clause on p. 36 is so palpably a clerical error that I do not think it will mislead any one. The words should be, "if there are ceiling joists."

The other clauses referred to I am content to leave as they stand. JOHN LEANING.

VARIORUM.

THE Science and Art Department's "Directory (revised to July, 1887), with Regulations for Establishing and Conducting Science and Art Schools and Classes," has just been issued, price sixpence (London: Eyre & Spottiswoode). The rules in the present edition, we are told, "supersede those in all former editions," but "are always subject to revision." The "Directory" gives "the Regulations common to Science and Art," and describes the nature of the "aid granted towards instruction in Science and Art." As an authoritative setting-forth of the wishes and commands of "South Kensington," the book will be very handy for reference, by students as well as by teachers. —— Mr. Banister Fletcher, F.R.I.B.A., has done well to publish in pamphlet form his lecture, delivered at Carpenters' Hall in March last, on "English Carpenters and Foreign Competition" (London: B.T. Batsford, 52, High Holborn). As was noticed in our columns at the time, the lecture abounds in statistics and other information pregnant with meaning to our English carpenters, who should not be slow to profit by Mr. Banister Fletcher's warning words.——"Health, and how to promote it, with Hints on House Drainage," &c., is a *brochure* consisting of a paper read by Mr. W. J. Addiscott, Assistant Inspector, Sanitary Department, Plymouth, in the George-street Lecture Hall (London: Alexander & Shepheard). Mr. Addiscott's views are, in the main, sound, and for the most part they are well expressed, but there are some bad misprints in the pamphlet, notably in line 18 of page 8, where for "facial" read "fœcal." ——"Petroleum: Hints to those who use it," is an illustrated pamphlet (printed by White & Pike, Moor-street, Birmingham), consisting of a series of articles by Mr. Boverton Redwood, F.C.S., and other authorities on the subject, who give statistics and other particulars relating to the natural supply of the oil, both American and Russian, the construction and use of petroleum lamps in relation to safety, the detection of bad and dangerous oils, and the use of petroleum as a fuel. Now that the dark evenings of winter are approaching, this pamphlet, if carefully read (it is sold for threepence), may be the means of preventing many a lamp "accident." —— From the City and Guilds of London Institute we have received the "Programme of Technological Examinations, Session 1887 – 88" (London: Published at the Central Institute, Exhibition-road, South Kensington). This is a work of similar character and usefulness to that mentioned at the outset as emanating from the Science and Art Department. In the list of subjects and examiners we find the following:—Carpentry and Joinery, Examiner, Mr. Banister Fletcher; Brickwork and Masonry, Mr. John Slater; Plumbers' work, Mr. S. S. Hellyer. We notice that candidates in either grade of Plumbers' work may, in addition to the written examination in that subject, present themselves for a practical examination, and candidates who pass this practical examination will receive a special certificate. The syllabuses of all other subjects have been revised, and important alterations made in some of them, particularly in Subject 34, "Carpentry and Joinery."——From the Phœnix Fire Office (19, Lombard-street) we have received a copy of the second issue of the tenth edition of "The Phœnix Fire Office Rules for Electric Light Installations and Electrical Power Installations," as drawn up by Mr. Musgrave Heaphy, C.E. We noticed the ninth edition when issued a few months ago (see *Builder*, May 28, 1887, p. 793). Mr. Heaphy informs us that although the rules have been extensively adopted since 1882 (they being the first of the kind, he says, drawn up in this country), not a single fire has yet occurred from any electrical installation that has been carried out in compliance with them. We notice, however, that Mr. Heaphy still deems it allowable for conductors to pass through party-walls, provision being made "so that the conductors cannot be a means whereby fire can be communicated from one risk to another." In our opinion, as we said when noticing the ninth edition, it is most undesirable that conductors should pass through a party-wall at all, and we think that such a course should be absolutely forbidden. We cannot but adhere to our view that if several houses are fed with the electric current from a common source, the connexions of the branches with the main should be perfectly separate for each house. But this notwithstanding, the value of Mr. Heaphy's rules as a whole is undoubted, and that they are widely appreciated is shown in the fact that they are largely used in America and the Colonies, while they have been translated into various foreign languages. As we have before said of these rules, no one should attempt to put up even a small installation without their guidance.

RECENT PATENTS.

ABSTRACTS OF SPECIFICATIONS.

12,574, Automatic Draught Regulators for Furnaces, &c. E. C. Mills.

According to this invention a copper expansion-rod is fixed in a straight length of the return pipe, and one end of the rod being fixed and the other free to move, a connexion is made by suitable mechanism on to the draught-door or damper of the furnace. When, by reason of the heat, or increased heat of the fluid in the return pipe, the afore-mentioned rod expands, the slight motion of its free end is multiplied largely by a slight angularity of the strut arms and tension rods, which are so fixed as to form a kind of combined horizontal and vertical lazy-tongs. The motions of the final pairs of rods are added together by the quadrant lever, whose fulcrum, mounted on the sliding tube, travels in one direction, while its "power centre" is caused by the internal rod to travel in the opposite direction; the weight or quadrant end thus traversing twice the distance it would if its fulcrum were stationary.

12,806, Improved Slide Rule. G. Bousfield.

The rule which is the subject of this patent has been constructed primarily to simplify the measuring of round, square, and unsquared timber, but it is also capable of very many other uses. The inventor claims, "in a slide rule the combination of a scale for taking off quantities from plans, a decimal slide for solving the various problems now obtained by the ordinary brass slide in slide rules, duodecimal scale for cubing round, square, and unsquared timber or scantling, and a graduated scale of standard measurement for showing, without calculation, a comparison between lineal, superficial, and cubic feet of any size, and the relative St. Petersburg standard measurement; the instrument also serving the purpose of an ordinary two-foot rule."

12,889, Chimney Tops or Caps. H. S. Obbard.

The mouth or orifice of the pot made according to this invention is contracted, and a fluted outer beading slopes inwards and upwards towards the mouth, so as to cause the smoke to issue with more force. The wind will carry the smoke upwards by means of the fluted beading, and by a slight overlapping of the mouth by the cap the wind is prevented from blowing down the chimney.

8,341, Improvements in Door and Window Fittings. W. Griffiths.

The principal part of the invention is the use of a flat-headed stud or pivot forced down into a socket by a flat spring. This is adapted as a fastening for doors and windows.

9,583, Wood Block Paving. D. Goddard.

The blocks in this system of paving are grooved both for the keys or tongues which bind them, and also on the lower edges for fixing the block to cement or asphalte bed.

9,635, Thumb Latches. J. Lurdley.

The latches which are the subject of this patent, instead of being mounted on a fixed stud or pivot, are mounted with a short crank arrangement by which the latch can be more easily lifted, and can also be used as a bolt by being pushed forward under a stud which prevents it from being raised from the outside.

9,666, Improved Flooring Cramp. W. B. and N. N. Haigh.

The principal improvement in this invention consists in making a cheap and efficient flooring cramp in as simple a manner as possible, and to dispense with the necessity for screwing or otherwise winding back the sliding head to release the board after nailing; after, by the action of a lever, the board has been forced home. Pressure on a little foot-plate at the side releases the ratchet which held it fast so long as was required. The construction is simple.

NEW APPLICATIONS FOR PATENTS.

Sept. 2.—11,903, H. Hosack, Heating and Circulating Water.—11,912, A. Boult, Door Fasteners.—11,937, J. Homan, Fireproof Floors.

Sept. 3.—11,957, J. Wiltshaw, Mounts of Door and Other Knobs.—11,961, B. Turner, Door Springs.—11,966, J. Petter, Stoves and Fireplaces.

Sept. 5.—11,993, G. Woodcroft, Sash Fasteners.—11,996, S. Rhodes, Making Bricks.—12,014, G. Brewer, Automatic Apparatus for Closing Doors.—12,023, G. Hayes, Bars for Glazed Sashes.

Sept. 6.—12,034, A. Ledger, Drawing Boards and T-squares.—12,052, H. and S. Denham, "Filler" used in French polishing.

Sept. 7.—12,116, E. Johnson, Lock Knob and Spindle.—12,117, J. Lee, Heating and Circulating Water.

Sept. 8.—12,133, T. Robinson, Cross Cut Saw Benches.—12,141, G. Kelley, Four-handed Reversible Door Lock and Latch.—12,156, W. Allen and R. Holmes, Bolts for Doors, Windows, Casements, &c.—12,161, G. Redfern, Water Meter.

PROVISIONAL SPECIFICATIONS ACCEPTED.

10,281, Q. Backus, Domestic Stoves and Chimney-pieces in combination.—10,376, C. Perrot and Others, Stove Grates.—10,762, W. Lewis, Fire-clay, Terra-Cotta, or Fire-brick Domestic Fireplaces.—10,779, E. de Pass, Imitation White and Coloured Marble.—10,377, W. Youlten, Fireproof Floor Construction.—10,895, J. Anderson, Stays and Fasteners for Hinged Window-sashes, Casements, or Doors.—10,902, E. Deacon, Locks, Catches, or Latches.—10,925, A. von Fuchs-Bauret, Water-closets, Privies, &c.—10,990, F. Henson, Bolts for Doors, Casements, &c.—11,193, J. Hale and C. Simmons, Water-closet Pans and Traps.—11,324, J. Smith and A. Roberts, Lavatories, &c.—11,435, A. Allom, Ventilation.—11,205, H. Gregeen, Combination Gully Trap and Channel.

COMPLETE SPECIFICATIONS ACCEPTED.

Open to Opposition for Two Months.

14,245, W. Stuttle, Hot-water Boiler for Heating Greenhouses, Conservatories, &c.—14,284, E. Verity and Others, Lever Latch for Doors.—14,322, J. Smeaton, Water-closets. — 6,539, F. Caulfield, Levelling and Surveying Instruments.—8,507, A.

Miller, Sectional Monuments.—10,726, A. Boult, Privies and Privy Seats.—13,603, C. Whitehouse, Augers and Boring Bits.—13,616, R. Scholefield, Brick and Tile Making Machinery.—14,443, A. Henderson, Door Latches, &c.—14,448, H. Johnson, Lock Bolt for Windows, Doors, &c.—14,469, H. & A. Foster, Sawing Machinery.—14,538, W. Sargent, Circular Glass Ventilators.—8,755, E. Emanuel, Flushing and Trapping Overflows to Water-closets.

RECENT SALES OF PROPERTY.

ESTATE EXCHANGE REPORT.

SEPTEMBER 5.

By JAMES LEWIS & Co.

Kentish Town—54, Willes-road, 34 years, ground-rent 5*l.*	£280
Camden Town—186, Great College-street, 42 years, ground-rent 10s.	400

SEPTEMBER 7.

By FRANK HARDS.

Greenwich—17, Stockwell-street, freehold	1,105
Catford—1 and 2, Ravensbourne-villas, 70 years, ground-rent 6*l.*	790

SEPTEMBER 8.

By E. STIMSON.

Peckham—43, Cop'eston-road, freehold	445
Camberwell—101, Grosvenor-park, 25½ years, ground-rent 4*l.* 10s.	220
Walworth—9, 10, 11, Smith-street, 19 years, ground-rent 12*l.*	330
Clapham, St. Stephen's-terrace—A ground-rent of 88*l.* per annum, 76 years	1,550
Canning Town—A ground-rent of 80*l.* 10s. per annum, 71 years	1,310
Brixton—30, Raeburn-street, 86 years, ground-rent 6*l.* 12s. 6d.	275
Wandsworth—8, Riverhall-street, 45 years, ground-rent 6*l.*	240
Peckham Rye—5, Amott-street, 86 years, ground-rent 4*l.* 10s.	225

By BLAKE & DANNATT.

Greenwich—14, College-place East, 18 years, ground-rent 1*l.* 15s.	130
Deptford—28 and 29, James-street, 61 years, ground-rent 5*l.*	325
Greenwich—109, King George-street, freehold	310

By C. C. & T. MOORE.

Mile End—62 to 70 even, Ernest-street, freehold	1,300
Commercial-road East—No. 683, 6½ years, ground-rent 7*l.*	55
Stratford—14 and 16, Burford-street; and 1, Wharf-road, 79 years, ground-rent 12*l.* 10s.	465
14, Wharf-road, freehold	275

Miscellanea.

Sale of Building Sites at Lee-on-the-Solent.—A few days ago a large company attended a sale of building sites by Messrs. Lumley, at the new sea-side watering place of Lee-on-the-Solent. The prices realised for the several lots sold were double those obtained at the early sales of the estate. The number of plots offered was twenty-eight, of various sizes, several of them containing an area of half an acre and upwards. On the sale commencing, there was an active demand for the several sites submitted. Three shop plots in the High-street, near the pier, having frontages of 36 ft., and depths of 120 ft., were sold for 65*l.* each. Three other sites in Cambridge-road and Portsmouth-road, having frontages of 120 ft. and similar depths, realised 95*l.* each. Two sites in Portsmouth-road, containing an area of half an acre each, with frontages of 88 ft., and depths of 250 ft., were sold for 145*l.* and 155*l.* each. The highest prices obtained were 270*l.* for a block in Gosport-road, having a frontage of 392 ft. and a depth of 105 ft., and containing an area of nearly an acre, and 220*l.* for another block opposite, having the same frontage of 392 ft., and a depth of 80 ft., and containing an area of nearly three-quarters of an acre. The purchaser of these two plots was Mr. Clifton, of London. It was stated that the plots afforded sites for the erection of nearly sixty cottages with 14 ft. frontages. A number of smaller plots, having frontages of from 40 ft. to 70 ft., and depths of from 80 ft. to 100 ft., were sold at prices ranging from 40*l.* to 55*l.* each.

"Leaflets of Furniture."—Under this title, Messrs. Walker & Sons, the well-known cabinet manufacturers of Bunhill-row, are now sending forth by instalments a preliminary issue of a portion of a new illustrated catalogue. The leaflets include illustrations of hall, library, dining-room, drawing-room, and bedroom furniture (most of it suitable in design), as well as a selection of Messrs. Walker's excellent wood chimneypieces and overmantels. We have, on former occasions, spoken of the excellence of workmanship which characterises Messrs. Walker's productions.

Church Fittings.—A set of oak choir-stalls has been placed in Brewood Church by a former parishioner, in commemoration of his residence in the neighbourhood for twenty-three years. They were constructed by Messrs. Jones & Willis, of Birmingham and London.

The Employers' Liability Bill.—At the meeting of the Trades' Union Congress at Swansea last week, Mr. Inglis moved:—"That this Congress regrets that the Government has failed to carry out the promise to deal with this subject during the present session of Parliament, and urges upon the Parliamentary Committee to persevere with the matter until an amendment of the existing law is carried upon the lines of the measure promoted by Messrs. Burt and Broadhurst." Mr. Inglis went through the proposed amendments to the present Act, all of which he said he cordially approved of. The employer should be responsible for the negligence of any person in his service, because they knew it was an easy matter for employers to relieve themselves from responsibility by their definition of "the person in charge." It should also be made illegal for employers to contract out of the Act. He felt assured that the Congress would confirm the amendments proposed, and he trusted that the members of the Parliamentary Committee would use every effort to get them passed. Mr. Matkin (Liverpool), who seconded the motion, thought they ought to do something more than express their opinion, of which no notice would be taken. The Parliamentary Committee should impress upon members of Parliament in the various districts the necessity of passing the amendments proposed. Mr. Pitt (Glasgow) and Mr. Munro (Belfast) said they did not think that three years' compensation was sufficient in cases of permanent injury or death. Mr. Inglis said that the Bill provided for compensation up to 500*l.* After some further discussion, the motion was carried.

Tasmanian Forests.—The Hobart correspondent of the *Australasian Builder* writes:—"Our new Minister of Land and Works has promised to bring the conservation of Tasmanian forests into a practical shape. At present restrictions prevent the cutting and sale of timber either for export or for use in our own markets, the latter a very manifest absurdity, because when the cutting is restricted to legitimate use there is no fear that the abundance of timber we possess can ever be unduly depleted. A ridiculous instance of how the present restrictions work was recently given on the west coast, where a bridge is being erected across a river, the materials used being American and New Zealand timber, imported at a heavy cost, while along the banks on each side of the stream fine timber is growing in abundance,—blue gum, myrtle, stringy bark, and celery top pine,—all eminently suited for the purpose. It is proposed now to lay open a good many acres of pine-bearing land on the west coast for public use, which will be the means of yielding revenue to the public exchequer, and a great convenience to the building trade and the general community."

Builders' and Contractors' Hardware.—Messrs. F. W. Reynolds & Co., of 73, Southwark-street, have sent us a very well-got-up and useful trade book, entitled "Architects' Illustrated Catalogue of Builders' and Contractors' Hardware." It contains particulars of open and close fire kitcheners, portable and "self-setting" ranges, boilers, gas-cooking apparatus, slow-combustion and register stoves (many of them appropriate and good in design), "parsons' grates," &c. This section of the catalogue is very complete. The catalogue also contains a large selection of Messrs. Reynolds's patent and other locks and furniture, brass-work, &c. Their new patent double-handed lever mortise and rim locks have much to recommend them. Stable fittings, sanitary appliances, and cast and wrought iron gates and railings are some of the numerous other goods figured and described in this very useful and presentable catalogue.

Messrs. R. Waygood & Co.—We have received from Messrs. R. Waygood & Co., the well-known engineers and lift-makers, a copy of the *Gazette* notice of the alterations in their firm, consequent on the retirement of the senior partner, Mr. J. M. Day, in favour of his son, Mr. Charles Day, who has for many years held a leading position in the business. We understand that, notwithstanding his retirement, Mr. Day, senior, will continue for the present to give the firm the benefit of his long experience in those departments which were under his more immediate personal control. The partners of the firm, as now constituted, are Mr. W. R. Green, Mr. H. C. Walker, and Mr. C. Day. The firm will continue to be known as "R. Waygood & Co."

The Importation of Bricks and Tiles into Turkey.—A correspondent of the *Manchester Courier*, writing from Constantinople, lays particular emphasis on the great demand for bricks, tiles, and draining pipes which he says exists in Turkey. Large quantities of solid and hollow bricks used to be imported formerly from Marseilles, but these are now produced in the country itself, and all foreign competition becomes impossible when such a low-priced and heavy article has to bear freight, duty, and loss by breakage. Flat tiles 13½ to the square mètre are furnished by Marseilles, and are substituted in all new buildings, and are displacing the round tiles produced in the country, which break under a slight weight. About 2,000,000 of such flat tiles are exported annually from Marseilles to Constantinople. They weigh 2,550 kilos., and their price in Marseilles is about 76 fr. Freight per steamer may be reckoned at 10 fr. per ton, and at about 5 fr. by sailing vessel. These tiles are, therefore, burdened with 50 per cent. of expenses in the shape of freight, duty, &c., and yet prove a profitable article of exportation, at least at present.

Glasgow Architectural Association.—The usual monthly meeting was held on the 6th inst.,—the President in the chair,—when three short papers were read. The first of these, "Friezes and Pilasters of the Italian Renaissance," by Mr. Geo. Tudhope, ere dealing with the subject-matter in detail, was prefaced by a brief notice of the general principles regulating the choice and application of ornament. A second paper by Mr. Geo. Mackenzie considered the figure subjects introduced into the sculptured ornaments of the same style, particularly the examples of Della Robbia, Raffaelle, Fièsole, and other masters. The third paper was by Mr. Wm. M'G. Petrie, and described the ornaments of one building, the Church of Sta. Maria at Brescia, one of the richest examples in Italy, illustrated like the preceding paper by numerous photographs, but supplemented by several sepia drawings. A short discussion ensued, followed by thanks to the several essayists.

Architecture at the University of Sydney.—From the *Sydney Morning Herald* for July 21st we learn that at a meeting of the Senate of the University of Sydney, seven applications which had been received for the position of Lecturer in Architecture during Michaelmas Term were received and duly considered. It was resolved, on the motion of the Vice-Chancellor, seconded by Professor Gurney,—"That Mr. John Sulman, F.R.I.B.A., be appointed to the office." Professor Gurney gave notice of the following motion,—"That Mr. Sulman be authorised to expend a sum not exceeding 100*l.* in preparing diagrams or drawings, &c., for use in his course of lectures on architecture." Mr. Sulman, whom we congratulate, is well known in London.

New Railway Station at Gloucester.—Mr. Jenkins, of Plymouth, to whom the contract was let at about 20,000*l.*, last week commenced operations for the construction of the new Great Western Railway Station at Gloucester. A number of men are engaged in digging foundations on the ground in the rear of the houses in George-street.

Grosvenor Gallery.—We are glad to learn from the *Athenæum* that there is shortly to be an exhibition at this Gallery of the works of the Russian painter, Verestschagin, an artist of remarkably original genius, whose works are well worthy of more attention than they have hitherto received in this country.

PRICES CURRENT OF MATERIALS.

TIMBER.	£. s. d.	£. s. d.
Greenheart, B.G. ....ton	6 0 0	7 10 0
Teak, E.I. ....load	8 10 0	13 0 0
Sequois, U.S. ....foot cube	0 2 3	0 3 0
Ash, Canada ....load	3 0 0	4 10 0
Birch ,, ...	2 0 0	3 10 0
Elm ,, ...	3 10 0	4 10 0
Fir, Dantsic, &c.	1 10 0	4 0 0
Oak ,, ...	2 10 0	4 10 0
Canada	3 0 0	6 0 0
Pine, Canada red	2 0 0	3 10 0
,, yellow	2 0 0	4 0 0
Lath, Dantsic ....fathom	3 0 0	5 0 0
St. Petersburg	4 0 0	5 10 0
Wainscot, Riga ....log	0 0 0	0 0 0
,, Odessa, crown....	2 10 0	3 0 0
Deals, Finland, 2nd and 1st...std.100	7 0 0	8 0 0
,, 4th and 3rd	5 10 0	6 10 0
Riga	5 10 0	7 0 0
St. Petersburg, 1st yellow	8 0 0	13 0 0
,, 2nd ,, ...	7 0 0	8 0 0
,, white	6 10 0	8 10 0

TIMBER (*continued*).	£.	s.	d.	£.	s.	d.
Swedish	6	0	0	14	0	0
White Sea	0	0	0	0	0	0
Canada, Pine, 1st	16	0	0	24	0	0
2nd	10	0	0	15	0	0
,, ,, 3rd, &c.	6	0	0	9	0	0
,, Spruce, 1st	8	0	0	9	0	0
,, 3rd and 2nd	5	0	0	7	0	0
New Brunswick, &c.	5	0	0	6	10	0
Battens, all kinds	4	0	0	10	10	0
Flooring Boards, sq., 1 in., prepared, First	0	8	0	0	11	0
Second	0	6	6	0	7	6
Other qualities	0	4	0	0	6	0
Cedar, Cuba ...foot	0	0	3½	0	0	3¾
Honduras, &c.	0	0	3	0	0	3½
Australian	0	0	2	0	0	3
Mahogany, Cuba	0	0	4	0	0	6½
St. Domingo, cargo average	0	0	4	0	0	5½
Mexican ,,	0	0	3½	0	0	3¾
Tobasco ,,	0	0	3½	0	0	5
Honduras ,,	0	0	3½	0	0	5
Maple, Bird's-eye	0	0	5	0	0	7
Rose, Rio ...ton	8	0	0	11	0	0
Bahia	7	0	0	9	0	0
Box, Turkey ...ton	5	0	0	12	0	0
Satin, St. Domingo ...foot	0	0	5	0	0	9
Porto Rico	0	0	6	0	0	10
Walnut, Italian	0	0	3½	0	0	5½
METALS.						
IRON—Bar, Welsh, in London...ton	4	7	6	4	15	0
,, ,, in Wales	4	2	6	4	7	6
,, Staffordshire, London	5	10	0	6	0	0

METALS (*continued*).	£.	s.	d.	£.	s.	d.
COPPER—						
British, cake and ingot ...ton	43	10	0	44	0	0
Best selected	44	10	0	45	10	0
Sheets, strong	50	0	0	0	0	0
Chili, bars	39	15	0	40	0	0
LEAD—						
Pig, Spanish ...ton	12	1	3	0	0	0
English, common brands	12	5	0	0	0	0
Sheet, English	13	6	3	0	0	0
SPELTER—						
Silesian, special ...ton	15	5	0	15	7	6
Ordinary brands	15	0	0	15	2	6
TIN—						
Straits ...ton	103	0	0	0	0	0
Australian	103	10	0	0	0	0
English ingots	106	10	0	0	0	0
OILS.						
Linseed ...ton	20	5	0	20	10	0
Cocoanut, Cochin	31	0	0	32	0	0
Ceylon	23	15	0	24	0	0
Palm, Lagos	22	0	0	22	10	0
Rapeseed, English pale	24	0	0	24	5	0
,, brown	22	15	0	0	0	0
Cottonseed, refined	21	10	0	0	0	0
Tallow and Oleine	25	0	0	45	0	0
Lubricating, U.S.	5	0	0	6	0	0
,, refined	5	0	0	12	0	0
TURPENTINE—						
American, in casks ...cwt.	1	4	9	0	0	0
TAR—						
Stockholm ...barrel	0	14	0	0	14	6
Archangel	0	9	6	0	9	9

COMPETITIONS, CONTRACTS, & PUBLIC APPOINTMENTS.

Epitome of Advertisements in this Number.

COMPETITIONS.

Nature of Work.	By whom required.	Premium.	Designs to be delivered.	Page.
Monument, Southport	Lifeb't Dis. Fund Com.	Not stated	Not stated...	ix.

CONTRACTS.

Nature of Work, or Materials.	By whom required.	Architect, Surveyor, or Engineer.	Tenders to be delivered.	Page.
Forming and Metalling Road	Trustees, Poyle Charity Estate, Guildford	W. G. Lower	Sept. 17th	ix.
Tarring Roofs, Repairing Guttering, &c.	Met. Asylums Board	*Official*	Sept. 19th	ii.
Foundations of Proposed Buildings	The Imperial Institute	T. E. Collcutt	do.	ii.
Firewood	Chelsea Guardians	*Official*	Sept. 20th	ii.
Kerbing, Metalling, and Channelling Works	Lewisham Bd. of Wks.	*Official*	do.	ii.
Sewering and Making-up Roads, &c.	Hendon Local Board	S. S. Grimley	Sept. 23rd	ii.
Boundary-Wall, S.W. Hospital	Met. Asylums Board	*Official*	do.	ii.
North Porch to Parish Church, Petersfield	The Committee	A. W. Blomfield	Sept. 24th	ix.
Water Fittings	Morley Corporation	*Official*	Sept. 26th	ii.
Firewood	City of London Union	do.	do.	ii.
Enlarging Post-Office, Shrewsbury	Com. of H.M. Works	do.	Sept. 27th	ii.
Public Offices, Kilburn	Willesden Local Board	E. Harnor	do.	ii.
Broken Guernsey Granite	do.	O. Claude Robson	do.	ii.
Making-up and Paving Road, &c.	Wandsworth Bd. of Wks	*Official*	do.	ix.
Firewood	West Ham Union	do.	Sept. 28th	ii.
English Eight-Day Dial Clocks	School Brd. for London	do.	Not stated	ii.
Erection of School, &c.	do.	do.	do.	ii.
Steam Laundry, Baths, &c., Tunbridge Wells	.....	Gosling & Gosling	do.	ii.

PUBLIC APPOINTMENTS.

Nature of Appointment.	By whom Advertised.	Salary.	Applications to be in.	Page
Assistant Surveyor of Buildings	Civil Service Com.	Not stated	Sept. 27th	xiv.
Draughtsman and Assistant Surveyors	do.	do.	do.	xiv.

TENDERS.

BERMONDSEY.—For rebuilding four cottages, Woodlands-place, Bermondsey, for Mr. Wilkins. Mr. E. Crosse, architect:—

£505 0 0
[No competition.]

CROYDON.—For the erection of "Salvation Army barracks" at Croydon, for "General" Booth. Mr. E. J. Sherwood, architect, 101, Queen Victoria-street, E.C. Quantities by the architect:—

Howe & White, Wallington	£1,998 0 0
Maides & Harper, Croydon	1,997 0 0
Smith & Bulled, Croydon	1,689 0 0
F. J. Coxhead, Leytonstone*	1,583 0 0

* Accepted.

FINGRINGHOE (Essex).—For the erection of cowshed, pulling down and rebuilding farm residence at Ballast Quay Farm, Fingringhoe, near Colchester, for Mr. Henry Goody. Mr. J. W. Start, architect and surveyor, Colchester:—

Harrison	£1,008 0 0
Dobson	973 0 0
Chambers	835 0 0
Shead, Colchester (accepted)	835 0 0

GLOUCESTER.—For the erection of "Salvation Army barracks" at Gloucester, for "General" Booth. Mr. E. J. Sherwood, architect, 101, Queen Victoria-street, London, E.C. Quantities by the architect:—

Geo. Gardner, Gloucester	£1,156 17 0
J. Munday, Wimbledon	1,110 0 0
D. Lane, Gloucester	1,010 0 0
W. Williams, Gloucester	990 0 0
W. Jones, Gloucester	984 0 0
F. J. Coxhead, Leytonstone	960 0 0
D. C. Jones & Co., Gloucester	948 0 0

HAMPSTEAD.—For new public baths, Finchley-road, Hampstead. Messrs. Spalding & Auld, architects. Quantities by Mr. G. Fleetwood:—

John Allen & Sons (accepted)	£13,425 0 0

LLANRWST.—For erection of stables and other outbuildings, for Mr. R. Jones. Mr. W. E. Jones, architect, Anglesea Estate Offices, Menai Bridge:—

W. & O. Pritchard, Llanfair, P.G.*	£280 0 0

* Accepted.

LONDON.—For alterations to 73 and 77, Queen Victoria-street, E.C. Mr. Robert J. Worley, architect:—

E. Toms	£1,586 0 0
Green & Lee	1,567 0 0
E. Lawrance & Sons (accepted)	1,553 0 0

LONDON.—For rebuilding No. 21, Wigmore-street, W. Mr. R. J. Worley, architect. Quantities by Mr. R. C. Gleed:—

Bush	£3,016 0 0
Perkins	2,945 0 0
Smith	2,883 0 0
Perry & Co.	2,754 0 0
W. & F. Croaker	2,753 0 0
Downs	2,745 0 0
E. Lawrance & Sons	2,685 0 0
E. Toms	2,643 0 0
Green & Lee	2,455 0 0

LONDON.—For erecting warehouse, No. 59, Mansell-street, Whitechapel, for Messrs. S. & H. Harris. Messrs. Wigg, Oliver, & Son, architects. Quantities by Mr. Herbert Paine:—

Pritchard & Sons	£3,060 0 0
Eaton	2,638 0 0
Little	2,585 0 0
Conder	2,479 0 0
Exton & Burton	2,119 0 0
Lask	2,112 0 0
Consett Bros.	2,068 0 0

LONDON.—For alterations to shop premises, 161 and 163, Old Kent-road, for Mr. T. Summers. Mr. J. S. Quilter architect:—

First Contract.

Wm. Downs	£1,220 0 0
Canning & Mullins	1,071 0 0
R. G. Battley, Old Kent-road*	997 0 0

* Accepted.

LONDON.—For building house and shop, at 478, Bethnal Green-road. Mr. J. W. Brooker, architect:—

Royal & Co.	£780 0 0
Allen	780 0 0
Burman & Son	590 0 0
W. & F. Croaker	588 0 0
Battley	585 0 0
Garrett	563 0 0

LONDON.—For alterations and additions to The Axe, Nuns-court, Aldermanbury. Mr. A. Dixon, architect:—

Walker	£432 0 0
A. White & Co.	419 0 0
Blyton	296 0 0

LYMINGTON.—For sewerage works at Lymington. Mr. James Lemon, M.Inst.C.E., Engineer:—

T. Neave, Leytonstone	£16,565 0 0	
Howell, Poole	14,995 7 7	
Whettam, Weymouth	13,350 0 0	
Sanders, Southampton	13,346 0 0	
Edwards, Southborne-on-Sea	13,334 0 0	
Neave & Son, Paddington	13,300 0 0	
Osenton, Erith	13,175 0 0	
Perkins, Lymington	13,047 0 0	
Harrison, Brighton	13,000 0 0	
Adams, Kingsland-road	12,998 0 0	
Frere & Co., London	12,986 0 0	
Meader, Cowes	12,560 0 0	
Kingswell, Isle of Wight	12,400 0 0	
Hill & Co., Plymouth	11,997 0 0	£11,929 10†
Hall, T. P., Southsea*	11,952 0 0	11,752 0†
W. H. Dearle, Chichester	11,490 0 0	11,380 0†

* Accepted.
† Amended tenders to postpone the commencement of the outfall works until March, 1888.

NEW MALDON.—For alterations and additions to The Grange, New Maldon. Messrs. E. Thomas & Son, architects:—

Scolfield	£242 0 0
Millar	190 0 0
A. White & Co.	157 0 0
Taylor & Son	110 0 0

NORWOOD.—For the erection of a Free Library building, for the Lambeth Libraries Commissioners. Mr. Sidney R. J. Smith, A.R.I.B.A., architect, 15, York-buildings, Adelphi. Quantities supplied:—

	Fittings.	Total.
Wallis Bros.	£4,956	£450 ... £5,406
Hall, Beddall, & Co.	3,783	449 ... 4,232
W. Smith	3,750	435 ... 4,185
Nightingale	3,653	425 ... 4,078
Holliday & Greenwood	3,719	347 ... 4,066
Higgs & Hill	3,694	348 ... 4,042
Candler	3,430	570 ... 4,000
J. & C. Bowyer	3,692	302 ... 3,994
J. O. Richardson	3,569	379 ... 3,948
F. & F. H. Higgs*	3,540	330 ... 3,870

* Accepted.

RAMSGATE.—For the erection of "Salvation Army barracks" at Ramsgate, for "General" Booth. Mr. E. J. Sherwood, architect, 101, Queen Victoria-street, London, E.C. Quantities by the architect:—

	Large Hall.	Small Hall.	Total.
J. Munday, Wimbledon	£1,650 0	£220	£1,870
W. W. Martin, Ramsgate	1,515 0	195	1,710
F. J. Coxhead, Leytonstone	1,331 0	166	1,497
M. Cozens, Canterbury*	—	—	1,487
Amos & Ford, Whitstable†	1,190 10	169	1,360

* Too late. † Accepted for large hall.

RICHMOND (Surrey).—For the supply of York stone paving and road materials. Mr. Walter Brooke, A.M.Inst.C.E., Town Surveyor:—

York Paving.	A. s.	A. d.	B. s.	B. d.
Bentley & Kay, Rastrick, Brighouse	—	.....	5	6
J. Brooke & Sons, Hipperholme, near Halifax (accepted)	—	.....	5	6
Camm Bros. Brighouse, Yorkshire	5	5	4	4
W. T. Chadwick, Liverpool	6	0	5	6
S. Genise & Co., Rotherhithe	—	.....	6	5
Hill & Sons, Manchester	—	.....	4	2
J. Munro & Son, Richmond	6	10	6	4½
J. Milnes & Son, Brighouse, Yorkshire	5	6	5	5
Nowell & Robson, Kensington	5	5	5	4
Scotgate Ash Co., Pateley Bridge	—	.....	5	4
Trickett & Sons, Millwall	—	.....	5	4
Vint Bros., Idle, near Bradford	—	.....	5	9
S. H. Watkins, Brentford	5	11	5	11
E. Webster & Co., Eccleshill	—	.....	5	9

A. Price per yard delivered in parish yard.
B. Price per yard deilvered on railway.

Road Materials (at per cubic yard).

	Broken Guernsey Granite. s.	d.	Broken Penlee Stone. s.	d.	Chalk Flints. s.	d.	Brown Flints. s.	d.
G. Alldred, Strand-on-the-Green	—		—		4	7	4	7
C. Covington, Railway Wharf, Battersea	—		—		4	7	4	7
Dally, Twickenham	—		—		4	6	4	4
Downs, Richmond	11	4	12	9	4	0*	4	0*
Eastwood & Co., Belvedere-road, Lambeth	—		—		—		4	2
Emmerson & Co., Brentford	—		—		5	6	4	9
Fennings & Co., London Bridge	11	10	—		—		—	
J. Horsford, Care, near Feversham	—		—		—		4	7
F. D. Kennedy, Richmond	13	6	—		5	5	5	2
A. & F. Manuelle, Leadenhall-street	11	7	—		—		—	
C. M. Manuelle, Fenchurch-street	12	0	—		—		—	
Mowlem & Co., Millbank	11	5	—		—		—	
Nowell & Robson, Kensington	11	0*	—		—		—	
G. Pearce, Brentford	—		—		4	11	4	5
J. Runnalls, Penzance	—		12	3*	—		—	
Wills & Packlan, Sittingbourne	—		—		—		4	8

* Accepted.

RAMSGATE.—For certain alterations and additions to Christ Church Schools, Ramsgate. Mr. E. L. Elgar, architect, Ramsgate:—

W. H. Port	£368 0 0
Newby Bros.	330 0 0
J. H. Forwalk	307 10 0
G. Claris	300 10 0
H. Bowman	295 0 0
J. Newby	286 0 0
White Bros. (accepted)	257 10 0

RICHMOND (Surrey).—For the erection of a billiard-room, lavatory, &c., at the Richmond Club, for Mr. H. Graham. Mr. F. W. Rhodes, architect, 80, Cornhill, E.C.:—

Winser & Co., 52, Buckingham Palace-road (accepted)	£913 10 0

STOCKPORT.—For the erection of industrial schools for girls, at Offerton, near Stockport. Mr. James Hunt, architect, Warren-street, Stockport. Quantities by the architect:—

J. F. Hayes, Tyldesley	£3,700 0 0
R. Bateson, Stockport	3,444 10 0
J. Broadhurst, Stockport	3,329 0 0
W. Southern & Sons, Manchester	3,250 0 0
R. Neill & Son, Manchester	3,220 0 0
W. H. & H. C. Brown, Stockport	3,183 0 0
W. Brown & Sons, Salford	3,135 0 0
W. Shaw, Manchester	3,110 0 0
T. & W. Meadows, Stockport	3,104 0 0
Burgess & Galt, Manchester	3,062 0 0
G. Macfarlane, Manchester	3,060 0 0
S. Robinson, Hyde	2,935 0 0
John Lee, Stockport	2,950 0 0
Froggart & Briggs, Stockport*	2,943 0 0
W. Storrs & Co., Limited, Stalybridge (too late).	

* Accepted.

STOCKPORT.—For additions and alterations to Wesleyan chapel, Heaton Moor. Mr. James Hunt, architect. No. 4, Warren-street, Stockport:—

W. Shaw, Manchester	£1,984 0 0
R. Bateson, Stockport	1,978 0 0
W. Southern & Sons, Manchester	1,945 0 0
S. Robinson, Hyde	1,933 0 0
G. Macfarlane, Manchester	1,880 0 0
Burgess & Galt, Manchester	1,840 0 0
Brown Bros., Stockport	1,798 0 0
Froggatt & Briggs, Stockport	1,739 0 0

THAMES DITTON.—For building village hall, Thames Ditton, for Mr. H. Speer. Mr. A. J. Style, architect, 3, Westminster-chambers:—

		Boarded Ceiling.
C. & T. Atkins	£1,080 0 0 ...	—
Matthews	790 0 0 ...	—
Callingham	755 0 0 ...	£9 10 0
Oldridge & Sons	744 10 0 ...	13 5 0

WESTMINSTER.—For the erection of the Iddesleigh Mansions, Westminster. Mr. Robert J. Worley, architect. Quantities supplied:—

E. Lawrance & Sons (accepted)	£26,000 0 0

*** **SPECIAL NOTICE.**—**Lists of Tenders frequently reach us too late for insertion. They should be delivered at our office, 46, Catherine-street, W.C., not later than 12 Noon on THURSDAYS.**

TO CORRESPONDENTS.

Registered Telegraphic Address, "THE BUILDER, LONDON."

W. P. B.—L. A. S. (we cannot accept statistics of that kind without full evidence of reliability. There is no class of facts in regard to which there are more inaccurate statements published).—A. B. (hardly worth while).—E. L. G. (already explained).—J. S. G.—R. E.—J. P.—J. M. (shall have attention).—W. T. C. (there are many practical difficulties in the way of your suggestion, especially in building in towns).—H. R. & Co.—C. S. (much too long).—G. C. (suggestion anticipated).—M. V. (shall have consideration).—E. D.—A. Wilson (we cannot find space for further correspondence on the subject).—W. S.—J. W. S. (should send amount).—A. Winfield (certainly safer to cut the sap wood off).—F. & H. (too late).—A. & G. (ditto).—E. W. W. (shall have attention).

All statements of facts, lists of tenders, &c., must be accompanied by the name and address of the sender, not necessarily for publication

We are compelled to decline pointing out books and giving addresses.

NOTE.—**The responsibility of signed articles, and papers read at public meetings, rests, of course, with the authors.**

We cannot undertake to return rejected communications.

Letters or communications (beyond mere news-items) which have been duplicated for other journals, are NOT DESIRED.

All communications regarding literary and artistic matters should be addressed to THE EDITOR; all communications relating to advertisements and other exclusively business matters should be addressed to THE PUBLISHER, and *not* to the Editor.

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Registered Telegraphic Address, **"THE BUILDER, LONDON."**

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Addressed to No. 46, Catherine-street, W.C.

Advertisements for the current week's issue must reach the Office before THREE o'clock p.m. on THURSDAY.

SPECIAL.—ALTERATIONS IN STANDING ADVERTISEMENTS or ORDERS TO DISCONTINUE same, must reach the Office before TEN o'clock on WEDNESDAY mornings.

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AN EDITION Printed on THIN PAPER, for FOREIGN CIRCULATION, is issued every week.

TERMS OF SUBSCRIPTION.

"THE BUILDER" is supplied DIRECT from the Office to residents in any part of the United Kingdom at the rate of 19s. per annum PREPAID. To all parts of Europe, America, Australia, and New Zealand, 26s. per annum. To India, China, Ceylon, &c. 30s. per annum. Remittances payable to DOUGLAS FOURDRINIER, Publisher, No. 46, Catherine-street, W.C.

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R. CULL & SON, *Palmerston-buildings, E.C.*

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OATES & GREEN, HALIFAX.
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R. CULL & SON'S Stores, Railway Arches, London-street, Bethnal Green Station, E.
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WESTWOOD GROUND. | STOKE GROUND.
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BLUE LIAS LIME
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For prices, &c., address S. & J. STAPLE, Quarry Owners, Stone and Lime Merchants, Stoke-under-Ham, Ilminster. [ADVT.

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Seyssel, Patent Metallic Lava, and White Asphaltes.
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LITHOGRAPHERS,
Employ a large and efficient Staff especially for Bills of Quantities, &c.
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Testimonials from Sanitary Engineers, Sanitary Inspectors, Medical Officers, &c. Highly spoken of by the leading trade papers.
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COLLINGE'S PATENT HINGES,
LEVER, SCREW, & BARREL BOLTS,
Self-Acting "FALL DOWN" GATE STOPS,
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36A, BOROUGH ROAD,
LONDON, S.E.
A LIBERAL DISCOUNT TO BUILDERS.

F. BRABY & CO.'S PATENT GLAZING

GLASS SET FREE,
ALLOWING EXPANSION AND CONTRACTION, AND PRECLUDING BREAKAGE.
ABSOLUTELY WATERTIGHT. PAINTING AND PUTTY SUPERSEDED.
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